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1963

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INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

APPOINTED UNDER A CONVENTION
BETWEEN CANADA AND THE UNITED STATES FOR THE
PROTECTION, PRESERVATION AND EXTENSION OF
THE SOCKEYE AND PINK SALMON FISHERIES IN
THE FRASER RIVER SYSTEM

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ANNUAL REPORT

1963

COMMISSIONERS

SENATOR THOMAS REID
A. J. WHITMORE
W. R. HOURSTON
DeWITT GILBERT
CLARENCE F. PAUTZKE
GEORGE C. STARLUND

NEW WESTMINSTER
CANADA
1964

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

MEMBERS
AND PERIOD OF SERVICE
SINCE THE INCEPTION OF THE COMMISSION
IN 1937

CANADA		UNITED STATES	
William A. Found	1937-1939	Edward W. Allen	1937-1951
A. L. Hager	1937-1948		1957-1957
Senator Thomas Reid	1937-	B. M. Brennan	1937-1942
A J. Whitmore	1939-	Charles E. Jackson	1937-1946
Olof Hanson	1948-1952	Fred J. Foster	1943-1947
H. R. MacMillan, C.B.E., D.Sc.	1952-1956	Milo Moore	1946-1949
F. D. Mathers	1956-1960		1957-1961
W. R. Hourston	1960-	Albert M. Day	1947-1954
		Alvin Anderson	1949-1950
		Robert J. Schoettler	1951-1957
		Elton B. Jones	1951-1957
		Arnie J. Suomela	1954-1961
		DeWitt Gilbert	1957-
		Clarence F. Pautzke	1961-
		George C. Starlund	1961-

INTERNATIONAL PACIFIC SALMON
FISHERIES COMMISSION

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DIRECTOR OF INVESTIGATIONS
LOYD A. ROYAL

NEW WESTMINSTER
CANADA
1964

REPORT OF THE
INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION
FOR THE YEAR 1963

The 1963 Fraser River sockeye run entering Convention waters totalled 3,790,202 fish, the second largest run of this cycle since 1903. The catch in relation to the size of the run was down considerably because of a strike by Canadian fishermen during the important part of the sockeye fishing season which resulted in 47.1 per cent of the run escaping the commercial fishery.

Since the 1963 strike of Canadian fishermen was the second in succession on this cycle year, the Commission considered it obligatory to inform the industry that it was interfering with the natural interrelationship of the four cycle year sockeye populations by upsetting the principle of equal or consistent annual fishing pressure established in 1951. This principle was evolved from historical information indicating that each major sockeye run originating above Hell's Gate has a *naturally* established four-year cyclical pattern of productivity involving one extremely large run, one medium run and two small runs. It was assumed in the acceptance of the above principle that unless the racial runs were fished at an equal rate each year regardless of run size that the effective natural controls of productivity, whatever they might be, would be upset artificially resulting in a lower total racial production for each four-year period. The possibility that a shift in year of the dominant run might occur from major fluctuations in the fishery was considered also. Since 1951, considerable evidence has been collected which tends to substantiate the initial judgment of the Commission.

The adherence to the principle of equal fishing pressure in the design of the recommended fishing regulations has continued for a period of thirteen years without objection from an informed industry. It was the Commission's 1963 report to the industry in December that the required uniformity in escapements had been upset which raised a question, for the first time, regarding this regulatory policy. Reports always have been made not only to the two governments but also to the fishing industry as to why, on the basis of available information, any fluctuation occurs in the size of a returning run of Fraser River sockeye or pink salmon.

The Commission is primarily interested in the artificial mortality factor represented by the fishery which has an obvious major relationship to the production of "maximum" fish populations under its control. A strike or lockout in the fishing industry can be beneficial on occasion by simplifying the control of the required catch or escapement. More often they adversely affect productivity. In 1958, the combined lockout and strike, when a part of the Adams sockeye run was delaying in Georgia Strait and during the latter part of its upstream migration, seriously injured the reproduction of the run in Little River by allowing an excess escapement which was late in arriving at the spawning grounds. It is believed with justification that the 1959 and the 1963 strikes have upset adversely the pattern and size of the Chilko runs. If the Commission had not reported this information to the governments and the industry it would be withholding information contrary to the public interest.

Since any adverse reference to a strike or lockout has important implications because of their widespread use for making economic readjustments within most industries, it appears important to report further on the Commission's considerations in relation to the possible effect of the 1959 and 1963 interruptions in fishing on the character and size of the Chilko sockeye runs.

The natural existence of quadrennial dominance in the annual production of Fraser River sockeye is well established for most of the major populations reproducing above Hell's Gate. In the case of the Fraser-Francois Lake run (Stellako and Nadina Rivers) and also the Stuart-Trembleur-Takla Lake run the history of these runs reveal the consistent occurrence of one large run every fourth year on the old 1913 cycle dating back to 1825 and is indicated in the report of Alexander Mackenzie in 1793. Intermittent records for the Thompson River area show a dominant run as early as 1841, also on the 1913 cycle.

The existence of continuing quadrennial dominance long before the establishment of a fishery indicates that natural controls on survival have existed in several major spawning areas and possibly in all of them. Early history of the Thompson River run reveals that the subdominant run occurred the year after the dominant run as it does today. Hudson's Bay Company records of Indian catches show that a subdominant run occurred in the Stuart system the year after the dominant run the same as was the case for the Thompson run. The subdominant run to the Fraser-Francois Lake system occurred the year prior to the dominant run and a similar situation for the Chilko run is indicated in the reports of the Fisheries Commissioner for British Columbia commencing in 1909. In all cases the dominant run occurred on the same cycle year and there were two very poor cyclical runs intervening between the subdominant and dominant runs.

With the establishment of the commercial fishery for Fraser River sockeye in 1866 which approached full development in the period 1897-1900, a major and artificial controlling factor on the size of the escapement was created. It is obvious, however, that the fishery up to 1913 was of such a character that quadrennial dominance was not upset. The large runs all occurred in the same year, hence the fishery was apparently unable to disturb the dominant character of the escapement. The size of the off year runs did decline in relation to the size of the dominant run as the fishery developed. Either the off year runs were overfished or the fishery brought about an increase in the dominant run which in turn changed the natural factors which controlled the productivity of the off year runs. Historical records are too limited to assess the actual cause of the changes in the size of the annual runs concurrent with the development of the fishery. Changes in annual production of Fraser River sockeye beginning with full development of the fishery are indicated in the following table:

Sockeye Catch of the Fraser River System
Including all Areas and all Gear

1898	5,040,000	1910	4,456,000
1899	11,368,000*	1911	2,179,000
1900	4,386,000	1912	3,363,000
1901	25,760,000	1913	31,343,000

* No satisfactory explanation is available for the large catch in 1899 since no subdominant runs occurred in that year to any of the major producing areas above Hell's Gate.

The obstruction at Hell's Gate in 1913 and its continuing adverse effect added a major artificial factor to that of the fishery in controlling the size of the annual escapements. In addition the Hell's Gate obstruction had a varying effect on the productivity of each annual escapement. It appears that true dominance was probably destroyed in the case of every population spawning above Hell's Gate. Escapements were so small even in the cycle years of the original large runs that it is doubtful that dominance controlling factors could have maintained themselves in their original state.

Because of fortuitous timing in its migration past Hell's Gate, combined with the elimination of splash dam operations on Adams River, the Adams River run rapidly increased in abundance commencing in 1922. *A dominant run soon was established, but on the cycle year of the old subdominant run.* A new subdominant run developed in the cycle year following, originally a year of very poor production. The Seymour River run has reestablished itself since the construction of the Hell's Gate fishways and obviously has adjusted its year of maximum productivity to that of the Adams run. Even though the Seymour and Adams Rivers enter Shuswap Lake at opposite ends and the runs spawn more than a month apart, dominant and subdominant runs now occur in unison in both rivers. The dominant run to both rivers occurs on the year of the original subdominant run.

The escapements to the Stellako River, tributary to Fraser Lake, have increased substantially since the construction of the fishways at Hell's Gate and dominant runs are now occurring on the original cycle year of the subdominant run—the year after the original dominant run. Here again we find that where dominance has shifted it has shifted in favor of the subdominant cycle year.

Another shift in the timing of the dominant run to that of the original subdominant run and the establishment of a new timing of the subdominant population is evident at Chilko. No historical records are available for the Chilko run until 1901, at which time the fishery had already been well developed. However, the occurrence of two poor runs followed by a fairly substantial subdominant run in advance of the dominant run is well established for the years prior to 1913.

The Chilko run apparently was less affected by the Hell's Gate obstruction than were the other runs migrating at the same time possibly because of a genetic adaptation to migrating to a spawning area located at 3800 feet elevation. Annual escapements to Chilko did suffer materially from the Hell's Gate obstruction in 1913 and the years following but the originally established relationship in the size of the annual runs was maintained until after 1941.

A large subdominant run returned to Chilko in 1940 and a very large dominant run occurred in 1941. The 1940 escapement reached the Chilko spawning grounds in good condition but the larger 1941 escapement was blocked and delayed at Hell's Gate. The result of the obstructed and delayed escapement was a shift in dominance to the 1940-1964 cycle year and the development of a new subdominant run on the 1939-1963 cycle year, originally the cycle of a poor or off year run.

In every case where major runs have shifted their dominant year it has been to the year of the subdominant run regardless of whether the subdominant run occurred before or after the dominant one. A new subdominant run has formed in its original relationship to the dominant run. In every case where dominance has shifted, the run in the year of the original dominant run has declined significantly in size.

A careful examination of all available information indicates that the subdominant run to Chilko is in the order of at least one-half the size of the dominant run and perhaps larger in some years whereas the relationship of the two runs at Adams River is about 1 to 10. The close relationship of the size of the two runs to Chilko indicates a more delicate balance existing between the two than at Adams River, whatever the cause. It appears logical that a shift in dominance in the runs to Chilko is more easily accomplished by any major influence on the annual escapement relationship than would be the case with the Adams population.

The Commission became concerned in 1959 when a maximum Chilko escapement occurred in that year because of the fishermen's strike combined with an above average return resulting from very favorable marine survival conditions. Since 1959 was the year of the subdominant run a maximum escapement was not desired because of the danger of shifting dominance to that cycle year. A maximum escapement was allowed in 1960, the year of the dominant run, in the hope that dominance could be maintained on that cycle year in spite of the large escapement in 1959. Without the dominant Chilko run, few sockeye would be available to the fishery on the 1960-1964 cycle. That dominance actually shifted in 1959 may be evident from the large return in 1963 and the indicated small run for 1964.

Another strike in 1963 allowed 1,002,000 sockeye or two and one-half times the maximum desired escapement to reach Chilko. If dominance shifted in 1959, and that seems to have happened, the excess escapement would not normally be deleterious to the future of the run since the surplus fish would have spawned mainly in unproductive areas. However, all but an estimated 100,000 fish died without spawning for reasons discussed under the section on escapement. Since the number of residual spawners was not sufficient to provide for a good subdominant run, let alone a maximum run, it is assumed that any possible shift in dominance in 1959 was lost by the mortality of spawners in 1963. In spite of the predicted decline in the once-dominant run in 1964 the Commission must assume that a sizeable escapement in the latter year will reestablish dominance in that cycle year when it is greatly needed to maintain the economy of the fishery.

The functioning of natural factors in controlling dominance and the related variation in the size of the annual sockeye population within a quadrennial cycle is not completely understood. Years of investigation of the Adams population, rearing in Shuswap Lake, reveals that predators must be responsible for quadrennial dominance in the runs to that area. Ward and Larkin (1964)* concluded that the phenomenon of cyclic dominance was probably maintained by depensatory predation in Shuswap Lake and that adverse effects might result from abandoning uniform fishing mortalities for each annual population regardless of their fairly consistent variation in relative size.

While Ward and Larkin's conclusions appear sound as applied to the Adams sockeye population the same conclusions cannot be applied to the Chilko population. At Chilko the fry to smolt survival rate over a relatively long period of time has remained reasonably constant from year to year indicating that predation hardly can be considered as the cause of dominance in this area. This lack of annual variation in the fry to smolt survival rate caused the Commission scientists to be hesitant in accepting the existence of true dominance in the Chilko sockeye population in spite of the fact that dominant and subdominant runs appeared evident back to 1901.

In recent years it has become increasingly evident that true dominance does exist in the Chilko sockeye population in spite of the lack of any information relating predators as a factor. Studies at Chilko now have been expanded to include a study of the physical condition of the seaward migrants as related to a possible variable food factor in Chilko Lake to determine if dominance is created after the smolts leave the lake.

Whatever the natural factors may be that control the variations in population size in the several major races of Fraser River sockeye they are real and have operated effectively in some cases for at least 138 years both before the existence

* Ward, F. J. and P. A. Larkin. 1964. Cyclic dominance in Adams River sockeye. Internat. Pacific Salmon Fish. Comm. Progress Report 11.

of a commercial fishery and after its development. Failure to operate the fishery in harmony with the dominance factor on the basis of the evidence can only lead to a shift in the dominance pattern, particularly at Chilko, or a reduced quadrennial production, or both. Only when the dominance factor is defined and controlled, the latter appearing highly unlikely, could a highly effective fishery be operated on the basis that the escapements can be varied without regard to its influence. As referenced previously, the loss of the dominant Chilko run in 1964 will have an adverse effect on the economy of the Fraser River fishery and its continued loss would be most serious. No other sockeye runs of major size occur in this cycle year and pink salmon run only on the odd year.

COMMISSION MEETINGS

The International Pacific Salmon Fisheries Commission held twenty-one formal meetings during 1963 with the approved minutes of these meetings being submitted to the Governments of Canada and the United States. The first meeting of the year was held on January 17 and 18, the meeting on January 18 being with the Commission's Advisory Committee composed of the following members:

United States	*Canada*
Howard Gray Sport Fishermen	J. C. Murray Sport Fishermen
F. Bullock Troll Fishermen	R. H. Stanton Troll Fishermen
John Plancich Salmon Processors	Richard Nelson Salmon Processors
N. Mladinich Purse Seine Fishermen	Harold Christenson (alternate for Charles Clarke) Purse Seine Fishermen
D. Milholland (alternate for J. Erisman) Gill Net Fishermen	Peter Jenewein Gill Net Fishermen
John Brown Reef Net Fishermen	H. Stavenes Purse Seine Crew Members

The tentative recommendations for regulatory control of the 1963 sockeye and pink salmon fishery in Convention waters as submitted to the Advisory Committee by the Commission on December 14, 1962, were reviewed and certain revisions made on the basis of the representations of the Advisory Committee. The potential pollution problems raised by the proposals to construct kraft pulp mills at Prince George and Kamloops, B. C., and the possible effects on the Fraser River sockeye and pink salmon were also reviewed with the Committee.

The Commission met in executive session on March 25, 1963, at which time the duties and obligations of the Canadian sport fishermen's representative on the Advisory Committee were discussed and it was agreed that in the event that sport fishermen thought that regulatory recommendations by the Commission were affecting other species of salmon they should make representation to the Canada Department of Fisheries. The existing status of regulatory control by the fisheries agencies of the Pacific Coast over longline fishing on the High Seas was discussed because of the considerable concern by the Commission over the consequences of such a fishery development on the Fraser River sockeye and pink salmon runs. The present status of the budget for 1963-1964 was examined and it was agreed to hold meetings in Washington and Ottawa with the government officials concerned. Plans for the construction of a spawning channel adjacent to Weaver Creek were examined.

On May 8, 1963, the Commission met in Washington, D.C., first in executive session at which time the budget for 1964-1965 was unanimously approved, then with members of the State and Interior Departments, the Bureau of the Budget

and the Canadian Embassy. A continuing program of construction to protect and extend the Fraser River pink and sockeye fisheries was presented together with the benefits to be derived from such compliance with the Commission's terms of reference. This meeting was followed by one in Ottawa on May 10, 1963, when the Commission met with the Minister, the Honourable H. J. Robichaud, the Deputy Minister and Assistant Deputy Minister of Fisheries, staff executives of the Department of Fisheries and of the Fisheries Research Board of Canada to present the reasons for an increased appropriation to cover the costs of a continuing program of capital construction for the protection and extension of the Fraser River sockeye and pink salmon runs.

The fifth meeting of 1963 was held on July 23 at which time the current status of funds requested of the United States Government for the 1963-1964 fiscal year were reviewed. Other items of business included a report on progress in constructing the Yale Rapids fishways, the need for surveys and investigation on Raft and Barriere Rivers to determine the possibility of artificial spawning channels for increasing the utilization of the sockeye rearing capacity of Kamloops Lake, the loss of sockeye fingerlings from aerial spraying of the westerly end of Shuswap Lake and the Little River with insecticide, modernization of the experimental hatchery in the Upper Pitt River area to include an upwelling gravel incubation area for sockeye and the progress of studies being carried out by the Pink Salmon Co-ordinating Committee.

The small size of the United States fishing fleet and the prevailing strike in the Canadian fishing industry necessitated meetings of the Commission on July 25, 30, August 2 and 6, in an attempt to maintain the best possible catch-escapement ratio of the early runs of sockeye salmon.

The tenth meeting of 1963 was held on August 20 to formulate regulatory action to compensate for the increasing disparity in the catch of pink salmon in favor of United States fishermen as a result of the large run of this species destined for Puget Sound streams.

On August 23, 1963 the Commission met with its Advisory Committee for a full review of the pink salmon run to date and the problems involved in attaining the desired escapement and equitable division of the allowable catch.

Special meetings of the Commission were required on August 27, 30 and September 3, 1963 for revision of the regulatory controls in the interest of adequate escapement and equitable division of the pink salmon catch.

On September 6, 1963 the Commission again met with its Advisory Committee for a review of conditions prevailing in the salmon fishery within Convention waters.

The necessity for further changes in the fishing regulations governing the pink salmon fishery in Convention waters required meetings of the Commission on September 11, 20 and 26, 1963.

The Commission met again on October 4, 1963 to consider final regulatory controls of pink salmon fishing especially those pertaining to District No. 1 of Canadian Convention waters. The sockeye escapement was reviewed with special consideration given to the extremely heavy mortalities of unspawned sockeye occurring in certain spawning areas, particularly Chilko.

On November 26, 1963 the Commission met in executive session to consider the status of the United States appropriation of funds for the current fiscal year and other items of business pertaining to the operations of the Commission.

The final meeting of the year was held on December 17 and 18, 1963 with the first day devoted to general business. On December 18 the annual open meeting was held with the Advisory Committee and approximately 650 members of the fishing industry. Information presented at the meeting included a review of the 1963 fishing season, a report on the escapements of sockeye and pink salmon, a discussion of the possible effects of the Canadian strike, an outline of the Commission's proposed construction program for the protection and extension of the Fraser River sockeye and pink salmon, a report on the mortality of unspawned Fraser River sockeye together with details regarding a continuing study of the problem and possible future preventative measures, a prediction of the 1964 sockeye run and the tentative recommendations for regulatory control of the 1964 sockeye fishery.

1963 REGULATIONS

Recommendations for regulations governing the 1963 sockeye and pink salmon fishery in Convention waters were adopted at a meeting of the Commission held on January 18, 1963 and submitted to the two national governments for approval and to the State of Washington for implementation on February 4, 1963. The recommendations for Canadian Convention waters were implemented by the Government of Canada by an Order-in-Council dated May 8, 1963 and for United States Convention waters by an Order of the Director of the Washington State Department of Fisheries on April 25, 1963.

The recommendations of the Commission were as follows:

Canadian Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries of the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends that regulations to the following effect, in the interests of such fisheries, be adopted by Order-in-Council as amendments to the Special Fishery Regulations for British Columbia, for the season of 1963 under authority of the Fisheries Act, namely:

1. (1) No person shall fish for sockeye or pink salmon in the waters of the southerly portion of District No. 3 embraced in Area 20 and that portion of Area 19 lying westerly of a straight line drawn across Juan de Fuca Strait joining William Head and Angeles Point through Race Rocks commencing at point of intersection with the international boundary line with purse seines:

(a) From the 23rd day of June, 1963, to the 3rd day of August, 1963, both dates inclusive; and

(b) From the 4th day of August, 1963, to the 31st day of August, 1963, both dates inclusive, except from six o'clock in the forenoon to six o'clock in the afternoon of Monday, Tuesday and Wednesday in each week.

(c) From the 1st day of September, 1963, to the 21st day of September, 1963, both dates inclusive, except from seven o'clock in the forenoon to seven o'clock in the afternoon of Monday, Tuesday and Wednesday in each week.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets:

(a) From the 23rd day of June, 1963, to the 3rd day of August, 1963, both dates inclusive; and

(b) From the 4th day of August, 1963, to the 31st day of August, 1963, both dates inclusive, except from

(i) six o'clock in the afternoon of Sunday to six o'clock in the forenoon of Monday; and

(ii) six o'clock in the afternoon of Monday to six o'clock in the forenoon of Tuesday; and

(iii) six o'clock in the afternoon of Tuesday to six o'clock in the forenoon of Wednesday of each week.

(c) From the 1st day of September, 1963, to the 21st day of September, 1963, both dates inclusive, except from

(i) seven o'clock in the afternoon of Sunday to seven o'clock in the forenoon of Monday; and

(ii) seven o'clock in the afternoon of Monday to seven o'clock in the forenoon of Tuesday; and

(iii) seven o'clock in the afternoon of Tuesday to seven o'clock in the forenoon of Wednesday of each week.

(3) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with commercial trolling gear from the 3rd day of August, 1963, to the 20th day of September, 1963, both dates inclusive, except from midnight Sunday to midnight Friday of each week.

2. No person shall fish for sockeye or pink salmon in the waters of the said southern portion of District No. 3 embraced in Areas 17 and 18 and that portion of Area 19 lying easterly of a straight line drawn across Juan de Fuca Strait joining William Head and Angeles Point through Race Rocks commencing at point of intersection with the international boundary line by means of nets:

(a) From the 30th day of June, 1963, to the 13th day of July, 1963, both dates inclusive; and

(b) From the 14th day of July, 1963, to the 10th day of August, 1963, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Thursday of each week; and

(c) From the 11th day of August, 1963, to the 31st day of August, 1963, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Wednesday of each week; and

(d) From the 1st day of September, 1963, to the 28th day of September, 1963, both dates inclusive, except in that portion of Area 17 lying westerly and northerly of a line projected from Point Young on Lasqueti Island to Thrasher Rock light thence in a westerly direction to Joan Point on Vancouver Island as authorized by the Area Director of Fisheries for British Columbia pursuant to the provisions of the British Columbia Fishery Regulations.

3. No person shall fish for sockeye or pink salmon in District No. 1 by means of nets:

(a) From the 30th day of June, 1963, to the 13th day of July, 1963, both dates inclusive, except for those sockeye or pink salmon taken in gill nets having mesh of not less than 8 inches extension measure for linen and 8½ inches extension measure for synthetic fibre nets as authorized for the taking of spring salmon by the Area Director of Fisheries for British Columbia and pursuant to the provisions of the British Columbia Fishery Regulations.

(b) From the 14th day of July, 1963, to the 10th day of August, 1963, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Thursday of each week; and

(c) From the 11th day of August, 1963, to the 31st day of August, 1963, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Wednesday of each week; and

(d) From the 1st day of September, 1963, to the 14th day of September, 1963, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week and except in the Convention waters of District No. 1 lying westerly and outside a line extending from Point Grey to

Point Grey buoy, thence to the light on the westerly end of North Arm Jetty, thence to Sand Heads light, thence to Canoe Pass buoy, thence to the light on the westerly end of Tsawwassen causeway and thence toward West Point Roberts light to the international boundary line from eight o'clock in the forenoon of Tuesday to eight o'clock in the forenoon of Thursday of each week; and

(e) From the 15th day of September, 1963, to the 21st day of September, 1963, both dates inclusive; and

(f) From the 22nd day of September, 1963, to the 12th day of October, 1963, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week.

4. No person shall fish for sockeye or pink salmon by means of commercial trolling gear in the Convention waters of Canada (Howe Sound not included) lying easterly and inside of a line projected from Gower Point at the northerly entrance to Howe Sound to Thrasher Rock light thence in a southeasterly direction to Salamanca Point on the southerly end of Galiano Island, thence in a straight line towards Point Roberts light to the intersection with the international boundary line thence following the international boundary line to its intersection with the mainland from the 11th day of August, 1963, to the 12th day of October, 1963, both dates inclusive, except at such times that net fishing other than with spring nets may be permitted within this area.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time."

United States Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends to the Director of Fisheries of the State of Washington, that regulations to the following effect in the interest of such fisheries, be adopted by him for the year 1963 by virtue of authority in him vested by Section 6 of Chapter 112 of the Laws of the State of Washington of 1949, namely:

1. (1) No person shall fish for sockeye or pink salmon in the Convention waters of the United States of America lying easterly of a straight line drawn from the lighthouse on Tatoosh Island in the State of Washington to Bonilla Point in the Province of British Columbia and westerly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia with purse seines:

(a) From the 23rd day of June, 1963, to the 3rd day of August, 1963, both dates inclusive; and

(b) From the 4th day of August, 1963, to the 21st day of September, 1963, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday, Tuesday and Wednesday of each week.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets:

(a) From the 23rd day of June, 1963, to the 3rd day of August, 1963, both dates inclusive; and

(b) From the 4th day of August, 1963, to the 21st day of September, 1963, both dates inclusive, except from

(i) seven o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday; and

(ii) seven o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday; and

(iii) seven o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday of each week.

(3) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with commercial trolling gear from the 3rd day of August, 1963, to the 20th day of September, 1963, both dates inclusive, except from midnight Sunday to midnight Friday of each week.

2. (1) No person shall fish for sockeye or pink salmon in the Convention waters of the United States of America lying easterly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia with purse seines or reef nets:

(a) From the 23rd day of June, 1963, to the 20th day of July, 1963, both dates inclusive; and

(b) From the 21st day of July, 1963, to the 28th day of September, 1963, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday, Tuesday and Wednesday of each week.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets:

(a) From the 23rd day of June, 1963, to the 20th day of July, 1963, both dates inclusive; and

(b) From the 21st day of July, 1963, to the 28th day of September, 1963, both dates inclusive, except from

(i) seven o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday; and

(ii) seven o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday; and

(iii) seven o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday of each week.

3. Section 2 above does not apply to sockeye or pink salmon taken in nets having mesh of not less than 8½ inches extension measure from the 23rd day of June, 1963, to the 20th day of July, 1963, both dates inclusive, when such net fishing gear has been authorized for the taking of chinook salmon by the Director of Fisheries of the State of Washington.

4. No person shall fish for sockeye or pink salmon in the Convention waters of the United States of America lying westerly of a straight line drawn true south from the Iwersen dock on Point Roberts in the State of Washington to the international boundary line from the 1st day of September, 1963, to the 28th day of September, 1963, both dates inclusive.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time.

In making the above recommendations for regulatory control of sockeye and pink salmon fishing in Convention waters of the United States of America for the year 1963 the Commission recognizes the need for the continued maintenance of certain preserves previously established by the Director of Fisheries of the State of Washington for the protection and preservation of other species of food fish."

Emergency Amendments

In order to provide for adequate racial escapements of Fraser River sockeye and pink salmon and for an equitable share of the season's catch of both species by the fishermen of Canada and the United States in view of developing runs and fishing operations, the approved regulations as detailed above were later amended on recommendation of the Commission. A detailed list of the regulatory amendments is as follows:

July 23, 1963—In view of the small size of the United States fishing fleet and the prevailing strike by Canadian fishermen an additional 24 hours of fishing was permitted in United States Convention waters lying easterly of the William Head-Angeles Point line effective July 25.

July 25, 1963—In the interest of preventing excessive escapement of sockeye to Chilko an additional 24 hours of fishing was permitted in United States Convention waters lying easterly of the William Head-Angeles Point line effective July 26.

July 26, 1963—In view of the continuing small United States fishing fleet, the Canadian strike and consequent excessive escapement to Chilko a further 24 hours fishing was permitted in United States Convention waters easterly of the William Head-Angeles Point line effective July 27.

July 30, 1963—In an attempt to control the excessive escapement to Chilko an additional 24 hours of fishing was permitted in United States Convention waters easterly of the William Head-Angeles Point line effective August 1.

August 1, 1963—For the same reasons a further extension in fishing time of 24 hours was granted in United States Convention waters effective August 2.

August 2, 1963—Indications were that normal fishing operations would be resumed within the Canadian industry by 6:00 p.m. on August 4. The sockeye escapement being considerably in excess of requirements fishing was opened in all Canadian Convention waters easterly of the William Head-Angeles Point line effective 6:00 p.m. August 4 rather than at 8:00 a.m. August 5 as originally proposed.

August 6, 1963—In the interest of full utilization of the current sockeye run and equitable division of the catch an additional 24 hours fishing was permitted in United States Convention waters easterly of the William Head-Angeles Point line effective August 8. For the same reason all Canadian Convention waters easterly of this line were opened for an additional 24 hours effective August 8.

August 13, 1963—For the purpose of equalizing the catch of sockeye and pink salmon, fishing was extended 24 hours in Canadian Convention waters lying westerly of the William Head-Angeles Point line effective August 15.

August 20, 1963—In the interest of division of the pink salmon catch and in view of the large run destined for Puget Sound streams fishing was permitted for an additional 48 hours in Canadian Convention waters westerly of the William Head-Angeles Point line effective August 22 and 23.

August 23, 1963—In the interest of increasing the escapement of Fraser River pink salmon, fishing in Canadian Convention waters westerly of the William Head-Angeles Point line was delayed 24 hours for the week commencing August 25.

August 27, 1963—Indications were that the Fraser pink run was of sufficient magnitude to warrant fishing in Canadian Convention waters westerly of the William Head-Angeles Point line for an additional 24 hours effective August 29. Also on the same date, in compliance with a request of the Washington State Department of Fisheries, United States Convention waters southerly of a line drawn from Dungeness light to Smith Island light to Outer Lawson Reef light to Burrows Island light to Fidalgo Head were opened for an additional 24 hours to permit a greater harvest of pink salmon destined for Puget Sound streams.

August 28, 1963—In the interest of harvesting a greater percentage of the current run of pink salmon and obtaining an equitable division of the allowable catch an additional 24 hours of fishing was permitted in Canadian Convention waters westerly of the William Head-Angeles Point line effective August 30.

August 30, 1963—In the interest of conservation of the Fraser River run of pink salmon the opening of fishing in Canadian Convention waters westerly of the William Head-Angeles Point line was delayed by 24 hours for the week commencing September 1. Also on the same date and for the same reason fishing time was reduced to two days in United States Convention waters except in the waters northerly and westerly of a line from Iwersen's dock on Point Roberts to Georgina light at Active Pass where a complete closure was in effect for the week commencing September 1.

September 3, 1963—In the interest of equitable division of the pink salmon catch 24 hours was added to the fishing time in Canadian Convention waters westerly of the William Head-Angeles Point line effective September 5. Also, on the same date, at the request of the Washington State Department of Fisheries the waters of the West Beach-Whidbey Island area were opened for an additional 48 hours effective September 4 and 5 to permit harvesting of the large pink salmon runs to the Puget Sound streams.

September 6, 1963—To obtain a greater escapement of Fraser River pinks and equitable division of the allowable catch, fishing time in Canadian Convention waters westerly of the William Head-Angeles Point line was reduced to two days effective September 10 and 11. In the Canadian Convention waters of District No. 1 fishing for pink salmon was restricted to September 9 outside of the "Blue Line" only. Also on this date the Department of Fisheries opened the Fraser River proper to fishing with spring salmon nets from 7:00 a.m. to 7:00 p.m. In view of the large numbers of delaying pink salmon being taken by troll gear that portion of Area 18 bounded by a straight line projected from Salamanca Point on Galiano Island to East Point on Saturna Island, thence in a straight line to Point Roberts light, thence in a straight line to Salamanca Point was closed to salmon trolling from 7:00 p.m. September 7 until further notice. As the abundance of Fraser River pink salmon in the Gulf area was still not adequate, fishing in United States Convention waters was restricted to September 10 and 11 except in the West Beach-Whidbey Island area where fishing was permitted for three days commencing on September 9. As a conservation measure United States Convention waters westerly of a line drawn from Lily Point true south to the international boundary were closed until September 15.

September 11, 1963—In view of the small escapement of pink salmon to the Gulf area fishing in United States Convention waters was limited to 48 hours effective September 18 and 19 and the closure of the waters westerly of the Lily Point line was maintained to September 22. On the same date and for the same reason fishing in Canadian Convention waters westerly of the

William Head-Angeles Point line was restricted to September 16 and 17 and in the waters easterly of this line fishing with spring salmon gill nets was permitted in the Fraser River proper from 7:00 a.m. to 7:00 p.m. on September 19 under regulation of the Department of Fisheries of Canada. During the following week fishing for sockeye and pink salmon was permitted for 24 hours effective September 23 in District No. 1 westerly of the "Blue Line".

September 20, 1963—In view of the current small catches of pink salmon in Juan de Fuca Strait and the necessity of obtaining additional escapement into the Fraser River area fishing in all United States Convention waters easterly of the William Head-Angeles Point line was closed for the week commencing September 22 and the existing closure in the waters westerly of the Lily Point line was extended to October 6. As the pink salmon run was virtually over in Juan de Fuca Strait the Commission relinquished control of all Convention waters westerly of the William Head-Angeles Point line effective September 22 and in United States Convention waters easterly of this line on September 29 with the exception of the closed area westerly of the Lily Point line.

September 26, 1963—Indications were that a favorable number of Late Fraser River pink salmon were in the Gulf area so 24 hours of fishing were permitted outside the "Blue Line" effective October 2. On the same date to permit a reasonable exploitation of the spring salmon run the Department of Fisheries authorized fishing with spring salmon nets from 7:00 a.m. to 7:00 p.m. in the Fraser River proper.

September 27, 1963—Further evidence indicated that the number of Late Fraser River pink salmon in the Gulf area warranted an additional 24 hours fishing time outside the "Blue Line" effective October 1.

October 4, 1963—Fishing was permitted for 24 hours on October 9 in District No. 1 for the purpose of taking not only the specified species but to permit the harvesting of other species as desired by the Department of Fisheries. Regulatory control was relinquished in United States Convention waters westerly of a line drawn true south from Lily Point effective October 6. Regulatory control of fishing in Canadian Convention waters easterly of the William Head-Angeles Point line was relinquished effective October 13 thus completing the Commission's regulatory obligations in Convention waters for the 1963 season.

SOCKEYE SALMON REPORT

The Fishery

The 1963 sockeye season was characterized by several outstanding events including a record early migration, a small United States fishing fleet, a fishermen's strike, and an excessive escapement with a pre-spawning mortality of 65 per cent.

The opening of the 1963 fishing season was delayed in all Convention waters lying easterly of the Angeles Point-William Head line to allow for complete protection of the Early Stuart run. This run was almost exterminated in 1955, two cycle years earlier, by a high water block to upstream migration in the Fraser River

Canyon. Because of the failure of the 1955 escapement to reach their spawning ground a fishing closure was placed in effect during the 1959 Early Stuart run. However only 2,663 Early Stuart sockeye returned to the spawning grounds; and in 1963, despite a similar closure only 4,627 sockeye reached the spawning area. In both years, estimates of the numbers of early season sockeye escaping the commercial fishery suggest that Early Stuart spawners have been considerably reduced by unusually heavy catches by the Indian subsistence fishery.

In spite of the net escapement of only 4,627 Early Stuart sockeye in 1963, lengthy delays in opening the sockeye fishing season should not be needed in future years. Highwater fishways currently under construction are designed to eliminate any known blocks or delays in the upstream migration of Early Stuart sockeye and hence this run, regardless of its small size in 'off years', should be able to withstand limited fishing.

The principal sockeye run in 1963 was destined for Chilko and it appeared in the United States fishery about 10 days earlier than anticipated. As a result of the early migration, significant numbers of Chilko sockeye were available in the United States fishing areas by July 18, four days in advance of the actual opening of the season. This early segment of the Chilko run could have been taken by fishermen in the Fraser River area which opened on July 14 but a total strike of Canadian fishermen became effective on that date and extended to August 4. Thus, any Chilko fish arriving during the week prior to the opening of the United States fishing season on July 21 escaped to the spawning grounds.

Extra fishing time was granted the United States fleet after the season opened with 11 days of fishing allowed during the following 12 day period. The United States fleet was reduced in size to the point that a substantial escapement occurred with almost continuous fishing. A combination of 100 per cent escapement of the small segment of the run which came through Johnstone Strait together with a sizeable escapement through United States Convention waters resulted in considerably more escapement to Chilko than was desired. Actually the total season's catch of 1,314,045 sockeye by United States fishermen did not exceed their allowable share in spite of the increase granted in fishing time.

With normal timing of the sockeye migration the Fraser River fishermen would have taken a substantial portion of the Chilko sockeye run after the strike terminated on August 4. In 1959 a large number of Chilko sockeye were available to the river fishermen after the termination of their strike on August 9 but, in 1963, because of the very early migration, the Chilko run had left the lower river fishing area by August 4.

When the United States fishing season opened on July 21 only 110 purse seines and 310 gill nets were operating. The size of the fleet increased during the second week of fishing to 155 purse seines and 414 gill nets. Later during the pink salmon run the purse seine fleet increased to 357 boats while the gill net fleet actually dropped to 262.

The catch of sockeye by United States gill nets was the largest on this cycle in history, totalling 365,873 fish or 27.84 per cent of the total catch. As a result of the increase in gill net landings of sockeye the purse seine catch was reduced to 65.65 per cent of the total (Table I), down from 77.42 per cent in 1959. Normally the reef nets are effective on Chilko sockeye but in 1963 these fish tended to migrate outside the reefs resulting in a relatively poor catch by this gear.

The expected catch of sockeye by Canadian fishermen in the Juan de Fuca Strait after the season opened in this area on August 4 did not materialize because most of the sockeye had migrated earlier than anticipated. The purse seine catch of sockeye in Juan de Fuca Strait was the lowest in history for this cycle but the large pink salmon run arrived shortly after the season opened and compensated for the scarcity of sockeye.

The average weight of the four-year-old sockeye run in 1963 of 5.52 pounds was up substantially from that recorded in 1959 (5.12 pounds) but still was below the cycle average of 5.92 pounds as indicated in the following table.

Cyclical Average Weights of Four-Year-Old Fraser River Sockeye

Cycle Year	*Average Weight Pounds*	*Cycle Year*	*Average Weight Pounds*	*Cycle Year*	*Average Weight Pounds*
1915	5.912	1931	5.983	1947	6.163
1919	5.589	1935	5.792	1951	7.208
1923	6.216	1939	5.723	1955	5.641
1927	6.079	1943	5.639	1959	5.124
				1963	5.520

Escapement

The net sockeye escapement to the spawning grounds of the Fraser River watershed was 1,600,000 fish (Table VI) or 42.2 per cent of the total run in Convention waters estimated at 3,790,000 sockeye. A total of 190,000 sockeye was taken by the Indian fishery located throughout the Fraser River basin (Table V). The Indian catch for 1963 is up 192 per cent over the catch of 65,049 fish taken by Indians during the brood year of 1959.

The escapement of 1,600,000 sockeye was considerably greater than the large escapement of 947,000 fish in the brood year and 4.22 times the escapement in 1955, the latter year producing the largest cyclical return since 1903. As an apparent result of the record early migration combined with high water temperatures on many of the spawning grounds and associated in a few cases with large or excessive numbers of spawners there was a total pre-spawning mortality of 65 per cent or 1,040,000 sockeye. Most of the mortality occurred at Chilko where approximately 90 per cent of the escapement, estimated at 1,002,000 fish, died as a result of the referenced factors.

Spawning populations other than Chilko that were adversely affected include Gates, Seymour, Raft, Endako, Early Nadina, Late Stuart and Stellako. Sockeye populations relatively unaffected by pre-spawning mortalities include all the late spawning populations returning to Cultus, Widgeon Slough, Harrison, Weaver, Portage, Adams (subdominant run) and Late Nadina. Earlier migrating populations which apparently were protected by cool water on the spawning grounds include the Early Stuart, Upper Pitt and Taseko.

Many of the sockeye at Chilko and in other streams having above average water temperatures were infected with a bacterial disease known as Columnaris which erodes the gill filaments and causes body lesions. This disease, which is generally associated with above average temperatures, was observed in 1961 when a similar mortality affected many of the Fraser River sockeye, particularly those in

the Horsefly River. Dr. Robert Pacha of the Department of Microbiology, School of Medicine, University of Washington, was retained as a consulting pathologist in connection with the 1963 mortality of unspawned sockeye and his report in part is detailed below.

> "Since all of the strains of *C. columnaris* isolated were found to be higher virulence types and since the other microorganisms isolated were found to be non-pathogenic, it is difficult to avoid the conclusion that columnaris disease was responsible for the mortalities which occurred in these waters. From the studies carried out in the Columbia River and its tributaries over the past several years, evidence has been obtained which indicates that the incidence and dissemination of columnaris disease among a population of fishes is favored by high water temperatures and congestion. In view of this it is very likely that the seriousness of the problem at Chilko was enhanced considerably by the warmer water which the fish encountered as a result of earlier than normal escapements and by the heavy population densities on the spawning grounds."

The Commission staff is currently making on exhaustive study of the relationship between pre-spawning mortality of each race and water temperatures both in the spawning area and in the Fraser River, taking into consideration arrival time and population density. Special attention is being given to possible evidence of genetically established tolerances.

A five year study of the consumption of stored energy, namely fat and protein, during migration, maturation and spawning of Fraser River sockeye has just been completed under the supervision of Drs. David Idler and Michael Smith, Technological Division, Fisheries Research Board of Canada. This study was designed originally by the Commission to assess the effects of delay at potential dam developments on the Fraser River and involved particularly the Early Stuart, Chilko and Adams River populations. The results of this study, now being prepared for publication, should be of importance in assessing the cause of such mortalities which prove to be unrelated to disease.

It is planned to develop a full time program of field investigation by a team of experts including a physiologist, a pathologist and a biochemist effective for the 1964 spawning season. This program will include an assessment, as soon as possible, of practicality of reducing pre-spawning mortality by the introduction of cool lake water where available to the individual spawning areas.

Any effective temperature control program would cost several million dollars. Even though the mortalities in 1961 and 1963 might result in economic losses to the industry several times greater than the cost of any control it is essential to assess the expected frequency of similar mortalities in future years. It is also essential that we understand the cause or causes of death before expending millions of dollars on what may appear on first consideration to be a theoretical desirable control program.

Rehabilitation

The Commission in earlier years attempted rehabilitation of sockeye populations by transplanting fingerlings but these operations were not successful. Evidence of highly variable successes, mediocre at best, has been observed in transplants of eyed eggs. In all cases donor stocks were selected having environmental characteristics similar to those of the recipient stream yet in several instances eyed egg transplants have failed to return a single adult fish.

Examples of the variable success of eyed egg transplants are those made in 1959 from which adult returns were expected in 1963. A total of 600,000 eyed eggs of Taseko Lake origin was planted in Harbour Creek, tributary to Upper Adams River. Later examination of the area indicated an excellent hatch yet not a single adult sockeye returned to the planted area in 1963. A total of 900,000 eyed eggs of Seymour River origin were planted in Upper Adams River in 1959. Conditions for observation were poor in 1963 but some fish — possibly 100 — returned with three dead sockeye actually recovered on the gravel bars. A plant of 490,000 eyed eggs of Raft River origin was made in Fennell Creek, tributary to North Barriere Lake. Although winter observations revealed a very high mortality of the eggs, 439 sockeye returned in 1963 to the planted area. Since 27 sockeye spawned in Fennell Creek in 1959, the return may have been from natural spawning but the number returning appears too high to have resulted solely from natural egg deposition. A fourth experiment involved a plant in Middle Shuswap River of 620,000 eyed eggs of Lower Adams River origin. While later examination indicated an excellent survival of the incubated eggs, not one sockeye was observed in the Middle Shuswap River in 1963.

The entire history of artificial propagation and transplantation of sockeye has been associated with many unexplained failures and the occasional and rather remarkable though unexplained success in areas other than the Fraser River watershed. It is obvious that the tolerance limits of individual populations of any species to environmental change must be measured and understood if expensive trial and error procedures are to be eliminated.

The Sweltzer Creek Field Station and the experimental Upper Pitt Hatchery were planned in part to study the problems involved in artificial propagation. Experiments to date have uncovered several obvious weaknesses in the standard methods for artificially propagating sockeye salmon. Alevins incubated in either the standard shallow or deep hatchery trough inevitably develop prematurely and result in fry which are small and weak. The only method developed so far for eliminating at least some of the adverse qualities observed in hatchery fry is to incubate the eggs and alevins in a porous gravel medium similar to that employed in artificial spawning channels involving either surface or upwelling flows.

While only two years of experimental observation have been concluded action has been taken to improve the operational procedure at the Upper Pitt River experimental hatchery. Since unstable flows and the resulting channel changes are rapidly destroying the natural productive capacity of this stream, successful artificial aids must be applied soon or the Pitt River sockeye run will become economically unimportant. Figure 1 shows a gravel incubation area which was placed in operation in time for the 1963 sockeye run. The water supply in this channel has been arranged to supply either upwelling or stream-type flow. A total of 3,189,000 eggs were spawned artificially and incubated in complete darkness in shallow hatchery troughs until they reached the eyed stage. The resulting total of 2,967,000 eyed eggs were placed in the gravel incubation area during the stream-flow type of operation. Immediately after the planting was completed the stream flow was changed to the upwelling flow, as shown in the picture, to prevent the formation of anchor ice during the winter period. Since sockeye fry will not migrate naturally from an upwelling flow area having little escape current, the flow again will be changed to the stream type prior to the expected emergence time in the spring of 1964. Based on previous controlled experiments the fry are expected to emerge at the same time as those produced by natural spawning in Pitt River and to be of the approximate size and condition of the wild fry.

FIGURE 1—Combination upwelling and stream type egg incubation area constructed at the Pitt River Experimental Hatchery to eliminate the adverse effects of standard hatchery methods on fry quality.

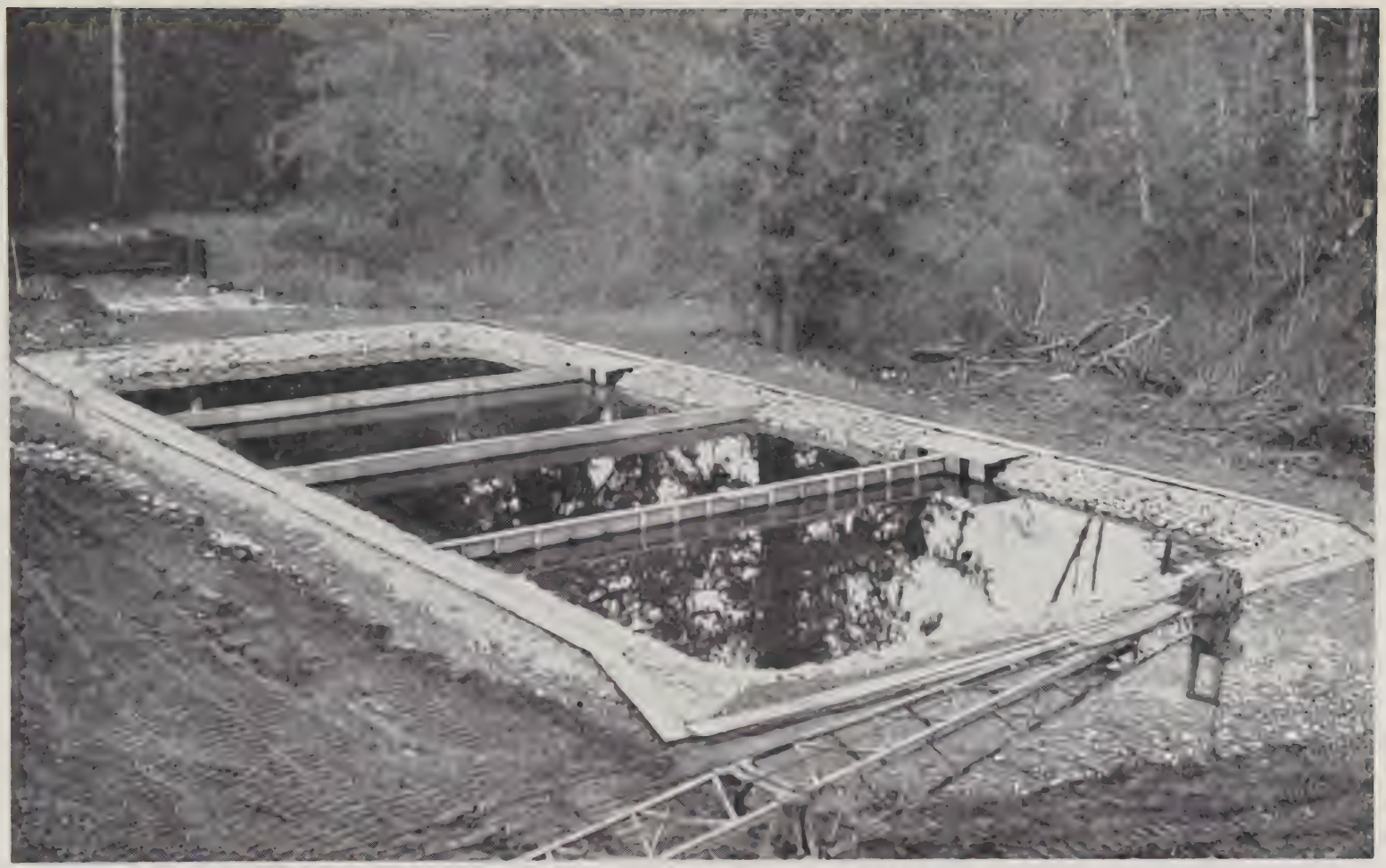

FIGURE 2.—Experimental upwelling spawning area constructed at the Swelt[illegible]r Creek Field Station. The area is divided into four sections to facilitate such experiments as density limitations and duplicate spawning for both sockeye and pink salmon.

Since prototype artificial spawning channels now in operation are producing fry which are apparently normal and the runs to these areas are improving, this method of propagation may be a suitable artificial aid for increasing fry production. The Jones Creek channel of the Canada Department of Fisheries, the Baker Lake channel of the Washington State Department of Fisheries and the Seton Creek channel built and operated by the Commission all provide promise for continued success in increasing fry production of both pink and sockeye salmon. A channel with a capacity for 20,000 sockeye is planned for construction adjacent to Weaver Creek. Field data currently are being collected on the Nadina, Barriere and Raft Rivers, tributary to Francois and Kamloops Lakes respectively, to determine the feasibility of building spawning channels adjacent to these streams.

With several large rearing lakes being underutilized by sockeye because of limited spawning area, and with several streams such as Upper Pitt River and Weaver Creek becoming very unstable, the future maintenance of Fraser River sockeye and pink salmon at maximum levels requires the development and operation of successful artificial aids. The spawning channel is cheap to build and operate but, when located in areas having extreme winter conditions, it still has operating problems that must be solved in advance of actual construction. An over-winter study of these cold weather operating problems is planned for 1964-1965.

An experimental spawning channel, illustrated in Figure 2, was constructed at the Sweltzer Creek Field Station. The channel will be used to determine desirable spawning densities of both pink and sockeye salmon and the effect of consecutive populations spawning in the same area. The channel will also provide normal fry for later experiments involving such things as the effects of pollutants and the physical changes occurring in young sockeye and pink salmon during their natural emigration from fresh to salt water.

Since transplantations of Fraser River sockeye over the past decade have not been particularly successful in returning runs to areas where the original runs were destroyed by the Hell's Gate obstruction, the Commission has decided to halt this effort temporarily. With the accumulation of more knowledge on environmental tolerance limits and the elimination of problems in operating spawning channels and/or hatcheries it is planned to design a new method for developing satisfactory and self-sustaining runs to such areas as Upper Adams and Middle Shuswap Rivers. These formerly productive areas are now barren except for the few fish returning in some years from earlier transplantations.

PINK SALMON REPORT

Origin of Catch

The total catch in Convention waters of 8,600,000 pink salmon was over eight times larger than in the cycle year of 1961 and was the largest since 1955 (Table XI). When the escapements to all streams of origin (Tables XIV and XV) and the non-Convention catches of stocks passing through Convention waters are considered there is reason to believe that the 1963 pink salmon run may have been the second largest since 1935, exceeded only by the run in 1947. Unfortunately, escapement figures for all major areas are not available prior to 1959 and total catch figures are not available prior to 1945, hence actual proof of the comparative size of the 1963 pink run cannot be presented.

The 1963 pink salmon run entering Convention waters was estimated at 16,100,000 fish of which 10,300,000 are considered to be of United States origin, 4,500,000 of Fraser River origin and 1,300,000 of non-Fraser Canadian origin. The method for estimating the origin of pink salmon stocks was developed by the Pink Salmon Co-ordinating Committee from an extensive marine tagging and spawning enumeration program carried out in 1959 augmented by some additional tagging in 1961 to fulfill the requirements of Article VI of the Pink Salmon Protocol. Data on catches and escapements together with other information have been exchanged between the Washington Department of Fisheries, the Canada Department of Fisheries and the Commission; all of these agencies being represented on the Pink Salmon Co-ordinating Committee.

Calculated Catches and Percentage Removal from the Pink Salmon Runs Entering the Convention Area in 1963

	Source of Run			
	United States	*Fraser*	*Canada Non-Fraser*	*Total*
Total Entering Convention Area	10,300,000	4,500,000	1,300 000	16,100 000
Catch in Canadian Convention Waters				
Westerly of William Head	2,579,799	1,021,940	114,045	3,715,784
Easterly of William Head	—	411,999	45,505	457,504
Total	2,579,799	1,433,939	159,550	4,173,288
Per Cent Removal	25.0	32.7		
Catch in United States Convention Waters	2,790,891	1,133,286	502,055	4,426,232
Per Cent Removal	27.0	25.1		
Total Catch Convention Area	5,370,690	2,567,225	661,605	8,599,520
Per Cent Removal	52.0	57.8		

The first pink run appeared in the Salmon Banks area shortly after the season opened on July 22 and consisted of fish primarily destined for the Nooksack River in the United States and Howe Sound, Burrard and Jervis Inlets in Canada. Record catches were made during this period (see below) exceeding by almost three times the substantial catch made in United States waters during the same period in 1961. The non-Fraser Canadian streams have not contributed significantly to the United States catches since the beginning of daily catch records in 1935. The substantial showing of the run for the first time in 1961 followed by substantially larger catches in 1963 raises a serious question as to whether the run has increased in size in proportion to the increase in catches or whether a larger percentage of the run is now approaching through Juan de Fuca Strait.

United States Catches of Pink Salmon from July 22 - August 5

1935	69,622	1945	60,877	1955	42,229
1937	112,117	1947	3,817	1957	27,508
1939	34,240	1949	122,000	1959	42,618
1941	88,924	1951	35,985	1961	144,557
1943	30,542	1953	45,724	1963	411,672

The increasing abundance of the run to Canada non-Fraser streams is evident in the larger escapements to these Canadian streams in recent years (Table XV). Reports of the Canada Department of Fisheries substantiate that the escapements

even in 1959 represent sizeable increases over those occurring in earlier years. However, it can be noted that United States catches during the passage of this run through Convention waters have increased by a factor of 10 from 43,000 fish in 1959 to 412,000 in 1963 while the combined escapements to the Canada non-Fraser streams have increased only by a factor of 2 from 537,000 fish to 1,162,000. Since these escapements include fish which migrated both through Johnstone and Juan de Fuca Straits, it would appear that the proportion of the run to these streams which migrated by the southern route (estimated at 37.4 per cent in 1959) has increased substantially in 1961 and 1963. Since the Canadian fishermen were on strike from July 12 to August 4 in 1963 it does not appear reasonable for the 1963 escapement not to have been larger unless a much smaller proportion of the run (estimated at 62.6 per cent for the 1959 run) migrated through Johnstone Strait.

Since the Canadian Juan de Fuca Strait net fishery was not opened until August 4 and since the non-Fraser Canadian fish for unknown reasons are not significantly available to the Fraser Gulf fishery, the United States net fishermen benefited almost exclusively from a major part of the 1963 non-Fraser Canadian run as well as the Nooksack River run while these runs were passing through Convention waters.

The pink run to the United States streams totalling an estimated 10,300,000 fish may have been the largest run to this area since daily catch records commenced in 1935. This run is available in volume to the Convention waters net fishermen only in the Canadian Juan de Fuca Strait fishery and in the United States West Beach fishery adjacent to Whidbey Island, extending from Point Partridge to Deception Pass. An indication of the comparative volume of pinks destined for United States streams with that for previous years is revealed by the following catch statistics.

Catch at West Beach			*Non-Convention Catch in Puget Sound*	*Escapement*
1935	3,626		93,887	
1937	353,098		472,000	
1939	301,618		759,812	
1941	141,011		297,880	
1943	86,990		206,964	
1945	491,378		433,344	
1947	265,557	59%	580,238	
1949	401,867		1,355,970	
1951	122,176		514,213	
1953	427,114		1,048,599	
1955	264,412		479,275	
1957	105,397		366,611	
1959	78,684		189,734	540,700
1961	87,961		257,513	808,000
1963	2,179,821	41%	1,735,384	3,224,000
Total	5,310,780	100.0%		

The history of the United States run has been one involving rather heavy fishing with fishing time set at 6 days per week for several cycles prior to 1951, when it was reduced to 5 days. With the development of the effective Canadian Juan de Fuca Strait fishery in 1947 no significant adjustment was made in United States fishing time so the escapement to United States streams must have suffered accordingly. When the Pink Salmon Protocol became effective on July 3, 1957 the Commission reduced fishing time for Canadian fishermen in Juan de Fuca Strait from the previously established 5 days per week to 4 days and the West Beach fishery in United States waters from 5 days to 3 days per week. The Director of Fisheries of the State of Washington also reduced fishing time in United States non-Convention waters from 5 days to 3 days except for a limited Indian fishery which continued to operate on a five-day basis.

The 1957 run to United States streams was not of sufficient size to attract more than a very few purse seiners either to the West Beach or the Lower Puget Sound area. The percentage of the 1957 run escaping to United States streams is believed to have increased over that of the brood year as a result of reduced fishing time but the fry from this escapement encountered the same record high marine water temperatures as the fry from the Fraser River when they entered their estuarial feeding grounds in 1958. A reduced fishing time was continued in 1959 both by the Commission and the Washington Director of Fisheries with the result that 540,700 fish or an estimated 42.5 per cent of the run escaped to United States streams. In the same year only 17 per cent of the Fraser run escaped.

In 1961 fishing was closed at West Beach from August 23 to September 18; this closure protecting a major part of the United States run while in United States Convention waters. An escapement of 808,000 pink salmon was reported in that year by the Washington Director of Fisheries.

Favorable survival conditions during spawning, incubation and marine life prevailed for all 1961 pink salmon escapements. However, there are not sufficient data available from all areas to explain why 10,300,000 pink salmon returned to United States streams from 808,000 spawners or a return of 12.7 to 1 while the Fraser River spawners produced a return of only 4.1 to 1 based on fish available in Convention waters. Actually the return ratio to the Fraser River would be nearly 5.0 to 1 if the catch of Fraser River origin in Johnstone Strait and other non-Convention waters in Canada were included. The latter is considered a favorable survival rate but certainly it is substantially below that for United States streams. Logically, more information regarding survival conditions affecting the United States run must be obtained in the future before reliable forecasts can be made of the size of that run.

The great predominance of the United States run over that destined for the Fraser River is unprecedented. It is explainable, in part, by the near extermination of a major part of the 1959 Fraser River population by record high flows during spawning followed by normal winter low water levels in 1959-1960. The adverse spawning conditions on the Fraser in 1959 were more severe than those existing in the United States streams hence production per spawner was greater for the 1959 brood in United States streams than for that for the Fraser. This set the stage for a substantial buildup in the United States run which was greatly accelerated by the phenomenal survival rate of the 1961 brood. Potentially, however, the total productive capacity of the Fraser appears greater than that of the United States streams so the relative abundance of the Fraser run should be regained in the near future.

The Fishery

The 1963 pink salmon fishery in Convention waters was extremely difficult to regulate because of the predominance of the United States run and its limited availability in Convention waters as compared with that for the smaller run destined for the Fraser River. The United States run is available in volume to the Canadian net fishery in Juan de Fuca Strait only and to United States net fishermen at West Beach.

Since the run to the United States streams and the early Fraser River run overlap substantially in timing, the Canadian net fishery in Juan de Fuca Strait harvested both runs at the same time. The United States fishery at West Beach harvested the United States run almost exclusively since less than 25,000 fish of the total catch of 2,180,000 pink salmon in this area in 1963 are considered to be of Fraser River origin. In 1959, when the Fraser run exceeded the 1963 run by a small margin, the total West Beach catch of Fraser River fish was only 11,000 fish on the basis of tagging in this area by the Pink Salmon Co-ordinating Committee. The United States net fishery, except at West Beach and a minor fishery in Juan de Fuca Strait, harvests principally fish of Fraser and Canada non-Fraser origin. Thus, to obtain division of the pink salmon catch between the two nationals in 1963 it was necessary to match the Canadian catch in Juan de Fuca Strait with the United States catch at West Beach.

The overlapping of the highly predominate United States run with the Fraser run in Juan de Fuca Strait made it difficult to distribute the Canadian catch of Fraser River origin between the Juan de Fuca Strait fishery and the Fraser River gill net fishery. However, in spite of an intense Canadian fishery in Juan de Fuca Strait required for the proper harvesting of the United States run, the Fraser River gill net fishery harvested 9.5 per cent of the Fraser River run compared with 8.2 per cent in 1961 and 9.1 per cent in 1959.

The smaller catches of United States fishermen in Convention fishing areas other than West Beach and the small catches of the Fraser River gill net fleet compared with the catches made in Juan de Fuca Strait by Canadian fishermen caused considerable disappointment to those who did not obtain their share of the benefits of the large run. Several pertinent questions were raised by these fishermen for which there appear to be logical answers.

The first point raised was that pink salmon of Fraser River origin may have been straying to United States streams. This was a logical point since the predominance of the latter run was unprecedented and there had not been a run of substantial size to these streams for many years. There is evidence available to substantiate that considerable straying of pink salmon can occur within a watershed but there is very little if any evidence that naturally returning runs will stray in substantial numbers from one watershed to another. Some important evidence that the Fraser pink salmon did not stray to United States streams in 1963 is available from information gathered at the Dungeness River which enters Juan de Fuca Strait from the south about 15 miles east of Port Angeles, Washington.

The Dungeness pink salmon run is much earlier in timing than the Fraser run and the fish are always small, averaging at least a pound less in weight than Fraser River fish. The escapement of Dungeness fish increased from 70,000 in 1961 to 400,000 in 1963 indicating a very high survival rate. For Fraser pink salmon to have strayed to the Dungeness River they would have had to change their timing and average weight substantially. Since the fish actually destined for the Fraser had normal timing and normal weight it is not conceivable that the Dungeness run

consisted of any strays from the Fraser River. Furthermore, the high survival rate of the runs to all United States streams is reflected in the survival rate of the run to the Dungeness River.

A second point raised by the industry was the possibility of Fraser fish migrating through the West Beach fishery in substantial and abnormal volume. If this were true it might have been possible that the Fraser run was heavily fished in the Juan de Fuca Strait and West Beach fisheries leaving insufficient Fraser fish available for the fishermen in other areas. Evidence that this did not occur is obvious for both the catches off the mouths of United States streams and the escapements to those streams indicated the phenomenal size of the runs known to have contributed to the West Beach catch. Furthermore, the daily catches at West Beach were so large that the three day weekly closures in that area would have released great surges of fish to the fisheries lying to the north of West Beach. The failure of such large numbers of fish to appear in the fisheries to the north including the Fraser River gill net fishery is further proof that the fish at West Beach were not destined for the Fraser River. Even further evidence was available from the observations of experienced fishermen that the fish were migrating in a southerly direction and not in a northerly direction as they would have to do if they were destined for the Fraser River.

A third point raised by the Canadian industry was, in effect, that too much fishing was allowed in the Canadian Juan de Fuca Strait fishery to the detriment of the Fraser River gill net catch. To provide a basis for discussing this point the following table is presented.

1963 Catch of Pink Salmon in Canadian Convention Waters

Fishing Area	*Source of Run*			
	United States	*Fraser*	*Canada Non-Fraser*	*Total*
West Coast Troll	234,370	86 460	29 919	350 749
Juan de Fuca Strait (including Sooke)	2,345,429	935,480	84,126	3,365,035
Fraser River	—	411,999	45,505	457,504
Total	2,579,799	1,433,939	159,550	4,173,288

Since it has been demonstrated that the Fraser pink salmon were not straying to United States streams and no unusual number of these fish were appearing at West Beach the above figures for the origin of the catch in Juan de Fuca must be accepted as approximately correct. Thus, the Canadian fishery in the latter area harvested 2,345,000 pink salmon of United States origin while catching 935,000 Fraser River fish or a ratio of 2.5 United States fish to 1.0 Fraser fish. To have reduced the Canadian catch of Fraser fish in the Juan de Fuca Strait fishery by one-half or 468,000 fish, allowing these additional fish to proceed through the United States fishery extending northerly from the San Juan Islands and eventually to the Fraser River gill net fishery, would have eliminated a catch of 1,173,000 pink salmon of United States origin by the Canadian fishermen. If this had happened, then division of the catch would have been upset to a serious degree, and after dividing the 467,000 escaping pink salmon between the United States fishermen, the Fraser gill net fishery and the escapement, little economic benefit would have accrued to anyone. While the total Canadian catch was less than that of the United States catch, an adjustment for fish loss to the Canadian fishermen during their strike results in a small surplus in favor of Canada.

Complete pink salmon catches and pack statistics are detailed in Tables XI to XIII.

Escapement

The total escapement of pink salmon to the Fraser River was 1,953,000 fish out of the total run available in Convention waters, estimated at 4,500,000 fish or 43.4 per cent of the run. The early run escapement of 972,879, while up slightly from that of the two previous cycle years, was still far from satisfactory. The potential size of the early run cannot be realized until the size of the escapement is far greater than that obtained in recent years. However, in view of the near-extermination of this run by high flows in 1959 a fairly substantial number of spawners are available to provide for a rapid recovery of this population under favorable spawning and marine survival conditions.

High water temperatures prevailed on the spawning grounds of the main Fraser and Thompson Rivers and resulted in an outbreak of Columnaris particularly among the fish spawning in the main Fraser. However, the mortality of unspawned fish was low and egg deposition was not affected to a significant extent. Experiments are now underway on the effect of diseased adults on the survival rate of eggs deposited. Apparently the principal effect of the high water temperatures was that an increased percentage of the early run fish moved upstream to spawn in the Thompson River and Seton Creek. The escapement to the latter areas was the largest since 1911, the last run before the Hell's Gate slide. The assumption that the heavy upriver movement was due to high water temperature is made on the basis that the main Fraser spawning declined in relation to total escapement plus the fact that the recovery of the upriver runs after the construction of the fishways in 1945 must have originated from an upstream extension or natural straying of the main Fraser spawning population. Thousands of pink salmon passed Bridge River Rapids this year, indicating a further extension of this population to the upper Fraser above Lillooet, B. C. However, it is doubtful if fish proceeding above Bridge River Rapids will reproduce successfully because winter water temperatures approach 32°F for an extended period. Historical records bear out that the Thompson River, Seton Creek, and the Nicola River, all being fed by warmer lake waters, are the only spawning grounds above Hell's Gate that are of major importance.

The late run escapement, which spawns principally in the Chilliwack-Vedder and Harrison Rivers, approached what is believed to be a maximum escapement. The total escapement of 980,453 fish is the largest for the late run since the Commission started enumeration of the escapement in 1957. The favorable escapement of the late run was made possible by the fact that it did not overlap the United States run as was the case with the early Fraser run hence regulatory action was possible, without the interference of other runs, to provide for a satisfactory catch-escapement ratio. Final assessment of the required maximum escapement of this population cannot be made until surveys are completed to determine the area of spawning gravel available. Once the latter is known the escapement requirements, as now assessed by field observations, can be refined on the basis of experimental data available in regard to favorable spawning densities for maximum fry production.

The Seton Creek artificial spawning channel was in operation for the second cycle year. In 1961 a total of 6,711 pink salmon or 11 per cent of the Seton Creek run entered the channel by natural selection. In 1963, it was intended to limit the number of fish entering the channel to 10,000, the estimated spawning capacity. However, because of the mass of dead spawned-out carcasses accumulating overnight on the entrance weir, the entrance gate failed and an additional 4,106 fish entered the channel before repairs could be made, for a total spawning population of 14,106. Winter sampling of the area indicates that a significant reduction will

occur in the percentage survival rate of the eggs deposited, presumably the result of overspawning. This assumption is substantiated by a decline in the egg survival rate in the Jones Creek channel from 63 to 29 per cent when the estimated spawning capacity of that channel was exceeded in 1961. It appears that the egg survival rate in spawning channels is extremely sensitive to any surplus number of spawners over the calculated capacity. This sensitivity is understandable since any excess fish have no way to escape the enclosure and must spawn in the gravel available whether or not it has been utilized previously.

Since thousands of pink salmon attempted to enter the channel after it was closed to entrance there is some indication that the adult return from the brood year spawning and the resulting egg-to-fry survival rate of 52.4 per cent may have returned enough adult pink salmon to pay for the capital cost of the channel in one year.

WATERSHED PROTECTION

All the inherent fisheries problems associated with major industrial development and increasing population within a large river basin are rapidly coming into focus in respect to the Fraser River. The terms of reference of the Commission as specified in the Sockeye Salmon Fisheries Convention call for the "protection and preservation of the sockeye and pink salmon of the Fraser River". This is a serious responsibility and requires that the Commission be familiar in detail with each proposal for the development of the basin. Only by so doing can it properly advise the Canadian Government, with its sovereignty in such matters, as to the technical requirements for fulfilling the terms of reference incorporated in the Convention. With the paucity of data available elsewhere, which can be of use to the Commission in its particular responsibility, it follows that the Commission must exert every effort to obtain the scientific information required to aid the Canadian Government in reaching solutions to the complex administrative problems involved.

The potential seriousness of the pollution problem was very much in the foreground during 1963. Construction was started on a 600 ton kraft pulp mill at Prince George. At the end of the year a satisfactory agreement for the treatment of wastes had not been reached with the Company involved, primarily because of a difference of opinion as to whether the Fraser River's capacity for dilution should be utilized in the disposal of toxic wastes or whether this capacity should be maintained as a margin of safety for the protection of the fishery resource. Another pulp mill is already proposed for the Prince George area, which increases the seriousness of the failure to reach an agreement with the Company currently involved. A kraft pulp mill also is proposed for immediate development near Kamloops, B. C., and negotiations for waste treatment apparently are proceeding satisfactorily with the Company involved.

The Canada Department of Fisheries has followed a policy that all wastes from industrial plants should be treated by any known methods to reduce their toxicity to a minimum regardless of the degree of subsequent dilution available in the adjacent waterway. It is the opinion of the Commission, based on historical evidence, that the policy of maximum elimination of toxic wastes is the only one which will prevent the gradual growth of industrial pollution to a point where it reaches the "out of control phase". In addition, this policy appears to be the only one which is fair to all industry. It prevents the acquisition of special benefits by those industries locating first as well as protecting the resources of the fishing industry.

Like most fisheries problems the available data on pollution are inadequate to assess the more obscure though potentially serious long term effects of industrial pollution on the maintenance of the fisheries resource. The Commission is concerned particularly with the effect of toxic elements, even though highly diluted, on the upstream migration of adult sockeye when they are already under stress because of natural vagaries in the environment; also the effects on the incubation of pink salmon eggs and on the ability of both sockeye and pink salmon emigrants to accomplish successfully the transition into the marine estuary. Little information is available on these latter problems and their importance cannot be assessed by simple laboratory bioassays which disregard the possible additive effects of various adverse features of the natural environment. An equally serious danger lies in the almost certain possibility of accidental spillages of highly toxic materials or the discharge of untreated wastes because of partial plant breakdowns.

The Commission has been handicapped by the lack of trained personnel in building up an effective pollution research unit capable of doing its part towards the protection of the Fraser River sockeye and pink salmon fisheries. The situation is being remedied gradually and valuable data are now becoming available.

Weed and insecticide spraying is being brought under control due to vigorous activity on the part of fisheries agencies operating in the area. Some uncontrolled spraying still occurs as evidenced by the loss of tens of thousands of underyearling Adams sockeye of the large 1962 brood due to spraying for mosquito control in the lake rearing area immediately adjacent to Adams River. Some loss of fish other than sockeye was apparently related to aerial spraying for weed control on a power line located in the valley of the Birkenhead River. Weed spraying along highways and railroads remains a potential if not an actual danger to the fisheries of the Fraser River.

The final recommendations of the Fraser River Basin Board for flood control on the Fraser River were nearing completion at the end of the year. The plan called for raising the protective dikes on the river delta by 2 to 3 feet and the eventual construction of five dams on the Clearwater River, one on the Cariboo River, one on the McGregor River and one on the main Fraser River above all sockeye migration at Grand Canyon. Consideration was given to flow and temperature control for fish during the salmon migration periods. While any dam may provide unforeseen complications to the maintenance of the fisheries resource it is obvious that the Board did its best to consider all the fisheries problems involved in the location and construction of dams for the storage of flood water. Potentially damaging floods will reoccur in the Fraser Basin so the immediate activation of the recommended dike improvement program would be of considerable value not only in the protection of property but in the protection of the fisheries resource.

Construction was started on additional fishways at Yale Rapids and Hell's Gate to improve high water passage conditions for Early Stuart sockeye but, due to the delay in the availability of funds, only the Yale Rapids fishways will be completed in time for the 1964 run.

A planning and investigational program for watershed improvement, including the eventual construction of temperature control and artificial spawning facilities, was inaugurated on a continuing basis. Plans were completed for a relatively large artificial sockeye spawning channel adjacent to Weaver Creek involving year around flow control through the storage of flood waters in Weaver Lake. A detailed report on this proposal will be submitted to the two governments early in 1964.

1963 PUBLICATIONS

1. Annual Report of the International Pacific Salmon Fisheries Commission for 1962.

2. Research Bulletin Number XIV.

   The Age, Sex Ratio and Size of Fraser River Sockeye Salmon 1915 to 1960 by S. R. Killick and W. A. Clemens.

TABLE I
SOCKEYE CATCH BY GEAR

United States Convention Waters

Year	Purse Seines			Gill Nets			Reef Nets			Total Catch
	Units	Catch	Percentage	Units	Catch	Percentage	Units	Catch	Percentage	
1963	191	862,616	65.65	450	365,873	27.84	64	85,110	6.48	1,314,045
1959	257	1,401,819	77.42	446	241,163	13.32	81	163,093	9.01	1,810,738
1955	286	621,527	61.74	584	282,995	28.11	88	102,088	10.15	1,006,610
1951	242	875,607	77.02	177	152,376	13.40	105	108,497	9.54	1,136,795

Canadian Convention Waters

Year	Purse Seines			Gill Nets			Traps			Total Catch
	Units	Catch	Percentage	Units	Catch	Percentage	Units	Catch	Percentage	
1963	81	115,115	16.76	1,328	561,345	81.75	0	0	0	686,681
1959	100	516,585	32.66	1,488	1,040,916	65.80	0	0	0	1,581,883
1955	104	462,934	41.78	1,348	625,207	56.42	5	18,548	1.67	1,108,081
1951	50	214,187	16.63	1,148	1,031,963	80.11	5	42,012	3.26	1,288,162

NOTE: Gear counts represent the maximum number of units delivering sockeye on any single day.
Unlisted troll catches of sockeye included in figures for total catch.

Table II

CYCLIC LANDINGS AND PACKS OF SOCKEYE FROM CONVENTION WATERS

	United States	*Canada*	*Total*
1963			
Total Landings (No. Sockeye)	1,314,045	686,681*	2,000,726
Share in Fish	65.68%	34.32%	
Total Pack (48 lb. Cases)	111,327	46,808***	158,135
Share in Pack	70.40%	29.60%	
1959			
Total Landings (No. Sockeye)	1,810,738	1,581,883**	3,392,621
Share in Fish	53.37%	46.63%	
Total Pack (48 lb. Cases)	135,489	123,248	258,737
Share in Pack	52.37%	47.63%	
1946-1963			
Total Landings (No. Sockeye)	31,416,115	30,743,094	62,159,209
Share in Fish	50.54%	49.46%	
Total Pack (48 lb. Cases)	2,760,946	2,658,271	5,419,217
Share in Pack	50.95%	49.05%	
1963 *Cycle Catch*			
1963	1,314,045	686,681	2,000,726
1959	1,810,738	1,581,883	3,392,621
1955	1,006,610	1,108,081	2,114,691
1951	1,136,795	1,288,162	2,424,957
1947	88,220	355,035	443,255
1943	242,077	349,011	591,088
1939	555,233	568,943	1,124,176
1935	615,502	825,508	1,441,010
1931	975,591	458,048	1,433,639
1927	1,069,557	713,930	1,783,487
1923	495,490	361,463	856,953
1919	778,669	470,199	1,248,868
1915	736,939	1,088,524	1,825,463
1911	1,447,919	730,714	2,178,633
1907	1,030,359	691,210	1,721,569
1903	1,911,127	2,341,492	4,252,619

* 1,047,410 Sockeye taken by United States fishermen during a strike by Canadian fishermen.

** 782,173 Sockeye taken by United States fishermen during a strike by Canadian fishermen.

*** 125,750 Sockeye taken but not canned by Canada.

TABLE III

DAILY CATCH OF SOCKEYE, 1951-1955-1959-1963 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1951	1955	1959	1963	1951	1955	1959	1963	1951	1955	1959	1963
1					57,324	53,990		112,848		2,556	23,297	
2	13,102				42,143	75,245		72,265	910		18,812	1,282
3	6,615				27,199	45,368	51,046		538			1,032
4	9,589	7,228					91,067		986	2,364		47
5	9,057	12,418					89,417	81,546	493	1,621		10
6	9,490	6,713	CLOSED		44,899		139,733	48,585	325	1,424		
7		3,409			27,696	48,429	167,337	29,274	137	703	5,401	
8				CLOSED	33,673	81,369	132,596	18,439		205	10,197	
9	23,677				19,943	54,024			265		7,266	28
10	10,244					40,503	93,493		1,254		11,143	439
11	8,156	7,824				25,131	124,278		33,599	330		421
12	6,570	8,251					80,698	37,789	6,580	255		
13	5,418	7,563			55,972		74,075	12,228	290	37		
14		7,265			39,260	30,632		14,300	138	131		
15					40,588	32,409				48	747	
16	16,435				39,036	31,554			149		495	
17	16,565				22,937	43,279	125,123		234		218	
18	12,476	16,903				27,280	83,286		109	142		32
19	13,501	17,687				2,222	64,087	6,193	109	70		6
20	14,630	13,795	7,112		9,835			4,269	285	76		
21		11,878	5,962		10,513	16,714		2,680	216	123	154	
22			5,008	33,394	7,992	12,623				77	99	
23	58,796			110,105	5,544	17,133	924		38		56	
24	59,917			130,412	2,162	10,967	125,615		9		8	
25	54,748	38,584		94,278		8,413	67,372		14	36		
26	45,817	13,949		92,026			17,846	2,648	7	6		
27	42,981	29,915	16,216	61,186	2,467		33,994	2,686	1	27		
28		30,647	20,278		7,489	10,136		2,330	2	45	1,941	
29			28,340	114,620	2,334	5,821		151		12	645	
30	64,435		44,671	121,644	1,346	5,372					553	19
31	79,869			104,333	853	4,307	29,018					
Totals	582,088	234,029	127,587	861,998	501,205	682,921	1,591,005	448,231	46,688	10,288	81,032	3,316
Troll and outside seine	5	10,011	437	240	6,756	63,702	4,188	203	53	757	27	1
Monthly Totals	582,093	244,040	128,024	862,238	507,961	746,623	1,595,193	448,434	46,741	11,045	81,059	3,317
June, Oct. and Nov. Totals										4,902	6,462	56
Season Totals									1,136.795	1,006,610	1,810,738	1,314,045

TABLE IV

DAILY CATCH OF SOCKEYE, 1951-1955-1959-1963 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1951	1955	1959	1963	1951	1955	1959	1963	1951	1955	1959	1963
1					34,757	12,463				6,361	18,874	
2	24,501				50,315	53,491			52	486	19,749	11,459
3	16,133				14,127	44,447	15,439		32,198		6,740	8,062
4	13,850	8,734				41,692	16,614	91,288	15,955		1,581	10,160
5	14,078	13,388					5,000	70,820	12,617	22,777		106
6	1,500	9,539	CLOSED	CLOSED	63,292		Strike	54,485	10,675	17,051	3,831	
7		7,305			30,490		July 26	44,820	6	14,849	7,269	
8					33,448		Aug. 9	9,987		12,715	14,422	
9	20,406				29,668	64,348	Incl.		20	128	27,728	15,879
10	11,909				18,040	61,049	228,536		15,622		31,362	57
11	8,186	5,701				66,105	145,352		7,739		306	12
12	9,464	5,122				38,165	125,006	59,034	9,229	146		
13	3,000	5,984			59,457		127,041	27,942	12,047	31,216		
14		5,960			27,445			8,205	25	16,921	24,349	
15					13,579	41,061		5,783		29	22,769	
16	15,184			784	8,442	52,783			4	3	16,543	4
17	10,116			1,503	2,453	31,403	165,960		40,944		22,802	2
18	10,134	9,561				29,679	83,683		27,599		18	
19	13,384	7,827				16,703	41,091	43,585	19,424	9		
20	1,580	10,906	10,360		22,812			13,553	313	8		
21		20,569	8,871		10,325			3,146	54	1	19,365	
22			12,214	3,757	14,583	12,249		3,979		10	10,636	
23	38,081			6,900	16,428	27,296	55,943	1,955		1	19,305	15,557
24	30,178			22,877	392	24,536	104,920		24,783		15,459	
25	32,319	58,985		Strike		21,638	49,084		12,057			6
26	43,327	45,546		July 12	305	7,510	32,174	11,487	5,139			0
27	10,313	26,579	4,672	to	46,086			15,577				
28		14,064	2,540	Aug. 4	23,673			1,175			6	
29				19,241	17,925	4,356		1,276			2	
30	76,209			21,981	20,425	20,417		590			1	
31	39,931			47,394	228	10,126	31,096					
Totals	443,783	255,770	38,657	124,437	558,695	681,517	1,226,939	468,687	246,502	122,711	283,117	61,304
Troll and outside seine		534	2,163	1,673	1,541	39,667	21,458	5,028			608	3,057
8" Gill Nets			506	732						693	37	618
Monthly Totals	443,783	256,304	41,326	126,842	560,236	721,184	1,248,397	473,715	246,502	123,404	283,762	64,979
June, Oct. and Nov. Totals									37,641	7,189	8,398	21,145
Season Totals									1,288,162	1,108,081	1,581,883	686,681

Table V

THE INDIAN CATCHES OF SOCKEYE SALMON BY DISTRICTS AND THE VARIOUS AREAS WITHIN THESE DISTRICTS, 1959, 1963

	1959		1963	
District and Area	*Catch*	*No. of Fishermen**	*Catch*	*No. of Fishermen**
HARRISON-BIRKENHEAD				
Skookumchuck and Douglas	965	—	1,740	21
Birkenhead River and Lillooet Lake	3 600	—	8.500	31
Harrison and Chehalis	1,450	—	520	17
TOTALS	6,015	—	10,760	69
LOWER FRASER				
Coquitlam to Chilliwack	10,365	—	45 865	88
Chilliwack to Hope	4,975	—	17,860	53
Vedder River and Vicinity	245	—	675	18
TOTALS	15,585	—	64.400	159
CANYON				
Hope to Lytton	6,595	—	55 000	250
TOTALS	6,595	—	55,000	250
LYTTON TO LILLOOET				
Lytton to Lillooet	5,100	—	7,898	55
TOTALS	5,100	—	7,898	55
BRIDGE RIVER RAPIDS				
Rapids	6,200	—	9,602	67
Pavillion			4,500	45
TOTALS	6,200	—	14,102	112
CHILCOTIN				
Farwell Canyon	1,805	—	2,285	10
Hances Canyon	2,282	—	4 749	11
Alexis Creek	4,103	—	4 092	11
Siwash Bridge	4,017	—	6,628	26
Keighley Holes	570	—	2,361	23
TOTALS	12,777	—	20,115	81
UPPER FRASER				
Shelley	108	—	212	11
Alkali and Canoe Creek	200	—	400	32
Chimney Creek	219	—	1,851	48
Soda Creek	100	—	550	10
Alexandria	30	—	60	2
Quesnel	130	—	235	3
TOTALS	787	—	3,308	106
NECHAKO				
Nautley Reserve	958	13	3.748	13
Stella Reserve	3,192	7	2,322	17
TOTALS	4,150	20	6,070	30
STUART				
Fort St. James	169	15	585	53
Tachie, Pinchi and Trembleur Villages	361	15	496	44
TOTALS	530	30	1,081	107
THOMPSON				
North Thompson River	425	—	308	44
South Thompson River	4,100	—	4,100	96
Thompson River	2,785	—	2,850	136
TOTALS	7,310	—	7,258	276
GRAND TOTALS	65,049		189,992	

* Number of permits issued to Indians in district.
The Indian catch statistics detailed above are obtained principally from the Protection Officers of the Canadian Department of Fisheries. These officers control the taking of sockeye for food by the Indian population residing throughout the Fraser River watershed.

TABLE VI

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1951, 1955, 1959, 1963

District and Streams	1963 Period of Peak Spawning	Estimated Number of Sockeye				Jacks	Sex Ratio	
		1951	1955	1959	1963		Males 4-5 yr.	Females 4-5 yr.
LOWER FRASER								
Cultus Lake	Dec. 3-7	13,143	26,000	48,461	20,571	268	9,032	11,271
Upper Pitt River	Sept. 4-8	37,837	17,552	15,740	12,680	0	6,654	6,026
Widgeon Slough	Nov. 1-5	745	—	637	353	0	185	168
HARRISON								
Big Silver Creek	Sept. 12-16	200	191	64	9	0	4	5
Harrison River	Nov. 12-18	17,145	5,595	28,562	22,287	29	12,455	9,803
Weaver Creek	Oct. 15-20	12,979	21,330	8,379	14,469	0	5,439	9,030
LILLOOET								
Birkenhead River	Sept. 21-25	55,862	25,355	38,604	67,151	18,258	17,425	31,468
SETON-ANDERSON								
Gates Creek	Aug. 25-29	—	86	867	4,858	745	1,851	2,262
Portage Creek	Oct. 23-27	30	43	572	2,011	0	861	1,150
SOUTH THOMPSON								
Seymour River	Aug. 25-29	24,344	9,511	52,325	71,690	36	33,287	38,367
Upper Adams River	——	0	0	0	6	0	3	3
Lower Adams River	Oct. 18-22	135,000	54,405	113,230	151,373	109	74,025	77,239
Little River	Oct. 20-25	9,690	9,072	21,030	5,148	4	2,517	2,627
South Thompson River	Oct. 20-25	500	0	472	45	0	22	23
Lower Shuswap River	Oct. 28-Nov. 5	0	23	0	23	0	11	12
NORTH THOMPSON								
Raft River	Aug. 24-28	8,561	5,364	10,210	8,724	41	3,942	4,741
Barriere River	Aug. 21-24	108	103	203	92	0	46	46
Fennell Creek	Aug. 23-27	——	——	27	439	3	144	292
North Thompson River	——	——	——	——	70	0	35	35
CHILCOTIN								
Chilko River	Sept. 16-20	118,110	128,081	470,621	1,002,252	4,021	454,959	543,272
Taseko Lake	Aug. 25-28	500	4,400	16,410	31,667	33	14,080	17,554
QUESNEL								
Horsefly River	Aug. 25-29	51	62	Present	86	3	36	47
Little Horsefly River	——	——	——	27	0	0	0	0
NECHAKO								
Endako River	Aug. 27-31	742	594	1,463	2,540	0	1,320	1,220
Nadina River (Early)	Aug 24-28	326	202	351	1,019	16	324	679
(Late)	Sept. 14-18			1,013	7,304	0	3,576	3,728
Nithi River	Aug. 20-24	90	79	218	763	0	293	470
Ormonde Creek	Aug. 25-29	120	27	74	41	0	15	26
Stellako River	Sept. 23-27	96,200	51,971	79,355	138,805	11	64,625	74,169
STUART								
Early Runs								
Driftwood River	Aug. 14-18	50	0	3	14	2	6	6
Forfar Creek	Aug. 4-8	13,600	68	281	652	4	195	453
Frypan Creek	Aug. 4-8	50	0	1	4	0	2	2
Gluske Creek	——	3,787	99	97	0	0	0	0
Kynoch Creek	Aug. 1-5	32,825	1,029	1,123	2,147	15	813	1,319
Narrows Creek	Aug. 3-6	400	27	167	180	0	60	120
Rossette Creek	Aug. 1-5	10,000	916	911	1,600	0	612	988
Shale Creek	Aug. 4-8	190	0	2	9	0	3	6
Misc. Streams	Aug. 4-8	121	31	78	21	0	8	13
Late Runs								
Kazchek Creek	Aug. 20-24	200	18	7	364	0	147	217
Middle River	Sept. 17-21	2,000	3,596	3,500	1,838	0	1,123	715
Tachie River	Sept. 24-28	100	4,000	2,500	1,035	15	488	532
NORTHEAST								
Upper Bowron River	Aug. 23-27	21,770	9,355	29,247	25,144	3	10,184	14,957
TOTALS		617,376	379,185	946,882	1,599,484	23,616	720,807	855,061

Table VII

DAILY CATCH OF SOCKEYE, 1948-1952-1956-1960 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1948	1952	1956	1960	1948	1952	1956	1960	1948	1952	1956	1960
1		5,011			118,062	40,805	59,168	117,041	2,707	711		3,777
2		8,640	4,286		100,423		41,245	54,285	391	597		
3		7,943	3,885		97,469			45,840	1,150	432	1,418	
4		4,857	2,365		67,360	32,815		45,845		434	606	
5			1,038		60,695	25,891			1,297	140	500	1,784
6					68,962	16,978	141,861		3,799		454	1,524
7		14,008				18,488	98,859	194,605	1,692	722	146	1,295
8	CLOSED	9,369		CLOSED	115,925	13,920		181,344	404	201		614
9		8,090	2,429		101,997			126,087	333	573		
10		6,796	1,803		38,878			96,389	134	636	78	
11		4,187	2,189		17,288	6,865		65,882		557	58	
12			1,423			7,055		42,416	212	410	33	CLOSED
13						2,697	24,347		205		119	
14		9,159				2,712	21,450		65	434	100	
15		10,812				2,831	12,509		15	299		
16		13,794	4,677				9,102		42	272		
17		16,876	8,146						140	193	43	
18	1,900	11,786	12,101	6,574		4 096				202	146	
19	2,469		15,053	6,329		3,143			233	151	49	50
20	6,345			6,823		2,730	13,151		88		23	130
21	8,602	90,696		7,550		967	8,831		20	117	37	56
22	5,657	32,619				612	4,955		24	135		38
23	5,142	34,320	78,518				2,252		11	85		
24		110,491	59,695						16	48	3	
25	17,524	134,294	39,052	78,450		220				47	3	CLOSED
26	22,251		31,635	38,405		720			16	34	4	
27	23,441			33,335		1,167	651		22		5	
28	42,887	128,339		32,087		1,310	727		429	20	5	
29	69,529	100,767				931	389	3,587	811	20		
30	78,843	96,565	113,200				524	2,064	319	31		
31		56,664	70,572			654		3,024				
Totals	284,590	916,083	452,067	209,553	787,059	187,607	440,021	978,409	14 575	7,501	3,830	9,268
Troll and outside seine	37			142	9	2	3,816	851		17	34	
Monthly Totals	284,627	916,083	452,067	209,695	787,068	187,609	443,837	979,260	14,575	7,518	3,864	9,268
June, Oct. and Nov. Totals									2,821	2,265	7,104	746
Season Totals									1,089,091	1,113,475	906,872	1,198,969

TABLE VIII

DAILY CATCH OF SOCKEYE, 1948-1952-1956-1960 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1948	1952	1956	1960	1948	1952	1956	1960	1948	1952	1956	1960
1		10,225				11,392	54,068		2,149	13,562		760
2		8,532			62,634		25,441	47,301	2,757	5,599		
3		12,241	8,554		54,876			194,327	15	3,343		
4		1,184	4,731	7,347	58,060					6,475	4,403	
5			6,501	6,170	74,788	108,955				10	1,448	491
6				4,544	18,427	36,472			2,830			222
7		13,476				23,048			1,028			71
8		10 009				911	154,050	108,471	388	8		
9		8,732			101,965		78,176	208,985	385	7		
10		9 000	4,773		62,668			87,843	11	7		
11		1,317	2,782	8,358	39,454	38,878		34,455		11	584	
12			2,474	4,686	35,812	12,321				12	260	1,402
13				4,341	1,645	11,433			1,927			464
14		13.063				9,381	53,080		1,437			32
15		8,249				110	15,765		1,663	28		
16		13,221			30,941			96,388	1,789	28		
17		22,896	7,570		24,102			45,676	3	27		
18		11,729	7,067	11,420	13,438	17,786		56,111		17		
19	1,281		9,459	14,424	11,031	9,714				17	6,916	
20	1,281			24,164	97	6,218			3,117		2,753	
21	1,283	5,299				5,443	17,444		931			
22	637	5,299				67	5,804	53,752	703			
23		5,299			15,618			17,274	859			
24		39,207	57,027		8,322						1,383	
25		48,841	22,609	84,939	8,302	21,489				1	193	
26	2,912		29,237	51,124	7,525	9,583				1	94	
27	2,967			60,451	84	6,535			5,523		29	
28	16,769	211,103				5,162	6,907		3,130			614
29	11,248	109,483				13	2,863	2,292	2,216	2		185
30	23,567	79,096			2,241			806	1,650	2		
31		120,159	181,981		1,623			885				
Totals	61,945	767,660	344,765	281,968	633,653	334 911	413,598	954,566	34.511	29,157	18,063	4,241
Troll and outside seine			91	670		811	111,659	2,092			57	109
Spring salmon gill nets								253			220	268
Monthly Totals	61,945	767,660	344,856	282,638	633,653	335,722	525,257	956,911	34.511	29,157	18,340	4,618
June, Oct. and Nov. Totals									22,582	21,844	6,383	11,028
Season Totals									752 691	1,154.383	894,836	1,255,195

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Table IX

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1948, 1952, 1956, 1960

District and Streams	1960 Period of Peak Spawning	Estimated Number of Sockeye			
		1948	1952	1956	1960
Lower Fraser					
Cultus Lake	Nov. 16-19	13,086	18,910	14,133	17,689
Upper Pitt River	Sept. 9-13	53,000	48,887	32,258	24,511
Widgeon Slough	Nov. 2-6	——	1,648	1,000	400
Harrison					
Bear Creek	Sept. 27-Oct. 3	——	——	——	189
Big Silver Creek	Sept. 15-25	12,000	6,031	6,187	4,522
Harrison River		26,000	25,794	3,184	17,279
Weaver Creek	Oct. 18-19	20,000	33,983	8,472	7,042
Lillooet					
Birkenhead River	Sept. 24-26	120,000	79,082	57,899	38,916
Seton - Anderson					
Gates Creek	Aug. 27-28	——	6,883	9,059	5,449
South Thompson					
Seymour River	Aug. 25-Sept. 2	4,000	6,785	2,684	3,047
Lower Adams River	Oct. 17-19	12,600	8,692	7,512	2,152
Little River	——	2,400	1,964	661	66
Scotch Creek	——	50	357	163	11
South Thompson River		100	200	0	0
Upper Adams River	——	0	0	0	Present
Momich River		——	——	——	1,000
North Thompson					
Raft River	Aug. 27-29	10,500	15,819	9,582	5,553
Barriere River	Sept. 6-12	——	——	——	23
Chilcotin					
Chilko River	Sept. 26-30	670,000	489,473	647,479	420,746
Taseko Lake	Aug. 31-Sept. 5	Present	3,647	1,995	2,524
Quesnel					
Horsefly River	Sept. 5-7, Sept. 14-18	50	7,013	2,944	3,087
Mitchell River	——	——	——	14	5
Little Horsefly River	Sept. 21-28, Oct. 8-16	——	——	——	23
Nechako					
Endako River	——	0	146	18	0
Nadina River	Aug. 19-22, Sept. 22-24	30	1,677	1,311	1,723
Nithi River	Aug. 26-27	1	45	36	31
Ormonde Creek	Aug. 22-24	150	996	331	158
Stellako River	Sept. 24-28	16,000	40,462	38,459	38,884
Stuart					
Early Runs					
Driftwood River	Aug. 22-26	——	38	50	34
Forfar Creek	Aug. 6-9	1,500	6,975	5,497	1,755
Gluske Creek	Aug. 6-9	1,500	5,911	4,619	2,138
Kynoch Creek	Aug. 6-9	7,500	13,439	9,535	4,154
Narrows Creek	Aug. 7-10	0	1,453	697	598
Rossette Creek	Aug. 4-9	1,500	3,575	3,863	4,558
Shale Creek	Aug. 10-14	0	414	185	139
Misc. Streams	——	——	1,775	711	1,196
Late Runs					
Kazchek Creek	Sept. 16-20	80	295	223	5
Middle River	Sept. 16-20	200	476	500	1,056
Tachie River	Sept. 22-30	20	364	600	1,687
Sakeniche River	——	——	——	131	0
Northeast					
Upper Bowron River	——	25,218	18,672	6,996	7,620
Totals		997,485	851,881	878,988	619,970

TABLE X
PINK CATCH BY GEAR

United States Convention Waters

	Purse Seines			Gill Nets			Reef Nets			Troll		Total
Year	Units	Catch	Percentage	Units	Catch	Percentage	Units	Catch	Percentage	Catch	Percentage	Catch
1963	357	3,454,287	78.04	262	382,424	8.64	69	89,768	2.03	499,753	11.29	4,426,232
1961	199	344,214	67.69	360	71,924	14.14	79	28,513	5.61	63,893	12.56	508,544
1959	317	1,913,555	78.83	446	227,643	9.38	81	110,416	4.55	175,921	7.24	2,427,535
1957	351	2,216,119	79.79	638	246,296	8.87	99	149,094	5.37	165,248	5.95	2,777,366

Canadian Convention Waters

	Purse Seines			Gill Nets			Traps			Troll		Total
Year	Units	Catch	Percentage	Units	Catch	Percentage	Units	Catch	Percentage	Catch	Percentage	Catch
1963	159	2,936,194	70.36	1,246	797,385	19.10	0	0	0	439,709	10.54	4,173,288
1961	82	313,636	57.53	1,116	142,518	26.14	0	0	0	88,974	16.33	545,128
1959	133	1,357,088	58.68	1,291	693,977	30.00	0	0	0	261,841	11.32	2,312,906
1957	105	1,435,924	54.50	1,473	1,126,085	42.74	5	31,309	1.19	41,402	1.57	2,634,720

NOTE: Gear counts represent the maximum number of units delivering pinks on any single day.

TABLE XI

LANDINGS AND PACKS OF PINK SALMON FROM CONVENTION WATERS

	United States	*Canada*	*Total*
1963			
Total Landings (No. of Pinks)	4,426 232	4,173,288	8,599,520
Share in Fish	51.47%	48.53%	
Total Pack (48 lb. Cases)	272,911	263,839	536,750*
Share in Pack	50.85%	49.15%	
1963 Catch	4,426,232	4,173,288	8,599,520
1961	508,544	545,128	1,053,672
1959	2,427,535	2,312,906	4,740,441
1957	2,777,366	2,634,720	5,412,086
1955	4,685,984	4,129,063	8,815,047
1953	4,951,429	4,142,117	9,093,546
1951	5,086,284	2,885,514	7,971,798
1949	6,235,400	3,189,662	9,425,062
1947	8,801,595	3,491,416	12,293,011
1945	5,458,890	1,279,849	6,738,739

* 196,961 Pinks taken by the United States and 172,102 taken by Canada were not canned.

TABLE XII

DAILY CATCH OF PINKS, 1957-1959-1961-1963 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1957	1959	1961	1963	1957	1959	1961	1963	1957	1959	1961	1963
1	1						34,070	52,307		187,274		
2							27,621	48,241	308,214	157,077		386,713
3			34			6,110			344,634			215,316
4			61			10,378			198,795			75,268
5			38		17,545	13,181		68,013				61,129
6					12,487	12,221		52,218			CLOSED	
7						13,229		40,441		108,145		
8		CLOSED		CLOSED		9,036		30,906		153,233		
9	7								143,732	133 600		103,803
10	1		494			10,105	64,389		82,101	132,028		193,448
11			398			16,642			115,338			188,781
12					24,436	17,634		102,743	56,951			
13					43,316	19,633		98,389	786			
14					57,329			84,776				
15	108						45,358			41,645		
16	235						21,451		40,133	30,919		
17	164		6,592			57,658			50,380	14,021		
18			8,234			41,664			35,730		4,023	91,403
19			12,592		99,644	36,950		173,834	146		1,790	24,221
20		1,063			89,534			166,400	49		1,265	
21		1,533			80,747		72,620	181,808		8,427		
22	1,423	1,127		7,831	110,833		51,641			8,204		
23	1,371			19,156		10,524			18,459	4,195		26
24	1,193		25,288	17,490		316,210			12,369	1,134		41
25			20,603	35,819		232,534			5,890		540	23
26			18,595	27,844	228,828	59,823		427,506			463	14
27		3,545		22,440	189,603	125,179		349,273			76	
28		5,506			133,673			263,222		3,790		
29	1,837	5,114		37,626	97,861			164,078		2,106		
30	3,386	4,276		44,316						2,252		12,753
31	2,848		24,759	44,595		232,046						
Totals	12,574	22,164	117,688	257,117	1,185,836	1,240,757	317,150	2,304,155	1,413,707	988 050	8,157	1,352,939
Troll	42,145	40,259	20,449	133,114	102,386	126,019	40,671	327,235	10,748	6,545	1,683	20,550
Monthly Totals	54,719	62,423	138,137	390,231	1,288,222	1,366,776	357,821	2,631,390	1,424,455	994,595	9 840	1,373,489
June, Oct. and Nov. Totals									9,970	3,741	2,746	31,122
Season Totals									2,777,366	2,427,535	508,544	4,426,232

TABLE XIII

DAILY CATCH OF PINKS, 1957-1959-1961-1963 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1957	1959	1961	1963	1957	1959	1961	1963	1957	1959	1961	1963
1	2				343		14,821			117,313		
2	1								192,149	89,335		67,539
3	1		1						180,181	99,848		182,611
4	6		1			13		5,237	147,730	19,653		210,058
5	7				20,779			31,344	91,813		3,335	178,872
6					41,304			57,540	58,796	95,733	2,198	
7					43,086			67,174		52,704		
8	6				162			775		92,362		
9	6				163		18,773		20,398	131,918		24,161
10	6		4			25,687	22,031		113,427	88,337		131,138
11	10		4			24,563			96,826	9,774		91,215
12	10		6		88,365	24,718		77,691	57,295		936	
13			29		53,273	34,625	4,954	86,575	40,518		569	
14					116,580		3,753	81,750		29,041		
15	22				79,958		80,913	106,538		57,720		
16	33						56,892		44,764	45,086		14,390
17	55		13,807			40,111			70,693	37,960		8,865
18	101		8,909			29,604			33,112	1,169		
19	19				79,913	1,749		142,007	42,847		344	
20		1,603			77,578			113,020	66,096		260	
21		1,807			91,077		15,144	125,864		20,122	431	
22	3,091	2,880			110,547		39,029	372,486		17,566		
23	7,849					201,421		187,652	1,455	36,721		71,976
24	5,078		27,564			225,659			1,628	22,104		
25	206		22,427			146,148			1,498			5,651
26			18,841		113,470	98,483		12,340	226		89	1,790
27					84,368			419,589	139		30	
28					114,618		5,480	243,875		93	22	
29	2,078				164,983		12,061	229,443		202		
30	8,170							220,827	10	63		
31	14,928		9,097			123,443						
Totals	41,685	6,290	100,690	0	1,280,567	976,224	273,851	2,581,727	1,261,601	1,064,824	8,214	988,266
Troll	3,398	27,542	26,208	100,316	30,460	179,795	34,659	214,245	4,788	44,467	20,038	106,578
Spring Salmon Gill Nets										482	37,330	12,894
Monthly Totals	45,083	33,832	126,898	100,316	1,311,027	1,156,019	308,510	2,795,972	1,266,389	1,109,773	65,582	1,107,738
June, Oct. and Nov. Totals									12,221	13,282	44,138	169,262
Season Totals									2,634,720	2,312,906	545,128	4,173,288

CLOSED

CLOSED

Strike July 12 - Aug. 4

Strike July 26 - Aug. 9

Table XIV

SUMMARY OF THE PINK SALMON ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS

District and Streams	*Period of Peak Spawning*	*Estimated Number of Pink Salmon* 1957	1959	1961	1963
EARLY RUNS					
LOWER FRASER					
Main Fraser	Sept. 25-30	1,263,651	733,933	549,400	516,831
HARRISON					
Chehalis River	Oct. 5-15	9,336	6,729	11,921	12,394
FRASER CANYON					
Coquihalla River	Oct. 1-6	4,433	16,088	7,316	14,971
Jones Creek	Oct. 1-6	1,493	2,604	5,088	3,500
Lorenzetti Creek	Oct. 1-6	6	991	218	13
Silver Creek	Oct. 2-8	549	1,914	705	590
Hunter Creek	Oct. 1-6	13	234	140	254
American Creek	Oct. 1-6	4	790	147	307
Spuzzum Creek	Oct. 3-9	1,076	2,111	263	364
Nahatlatch Creek	Sept. 29-Oct. 5	208	216	244	369
Anderson Creek	Oct. 3-9	824	567	166	676
Stein River	Oct. 4-10	185	62	83	231
Churn Creek	Oct. 7-14	8	0	0	81
Watson Bar Creek	Oct. 7-14	——	——	——	411
Texas Creek	——	0	195	0	——
Yale Creek	——	0	510	31	31
Emory Creek	——	0	728	22	36
Stoyoma Creek	——	0	42	0	——
Kawkawa Creek	Oct. 1-6	317	1,279	502	104
Ruby Creek	Oct. 3-9	0	528	448	614
SETON - ANDERSON					
Seton Creek	Oct. 5-15	58,810	14,887	52 006	107,318
Artificial Spawning Channel	Oct. 5-10	——	——	6,711	14,106
Portage Creek	Oct. 5-15	1,867	52	1,550	8,013
Bridge River	Oct. 7-14	0	1,201	1,895	6,422
THOMPSON					
Thompson River	Oct. 1-10	266,329	86,342	69,179	282,240
Nicola River	Oct. 1-5	1,560	806	216	1,196
Bonaparte River	Oct. 1-5	653	3	8	1,706
Deadman River	Oct. 1-5	564	0	8	101
Nicoamen River	Oct. 1-5	0	73	0	0
TOTAL		1,611,886	872,885	708,267	972,879
LATE RUNS					
LOWER FRASER					
Stave River	Oct. 20-25	6,500	1,383	3,994	910
Whonnock Creek	Oct. 20-25	549	57	278	255
Silverdale Creek	Oct. 20-25	52	68	88	151
Kanaka Creek	——	153	18	23	3
HARRISON					
Harrison River	Oct. 15-25	585,798	110,311	186,137	645,476
Weaver Creek	Oct. 20-25	346	87	539	693
CHILLIWACK-VEDDER					
Chilliwack-Vedder River	Oct. 13-25	212,446	91,517	188,066	313,167
Sweltzer Creek	Oct. 15-20	6,874	751	6,224	15,215
Slesse Creek	Oct. 10-15	——	317	55	1,578
Tamihi Creek	Oct. 10-15	——	——	——	101
Middle Creek	Oct. 15-20	——	528	434	2,904
TOTAL		812,718	205,037	385,838	980,453
GRAND TOTAL		2,424,604	1,077,922	1,094,105	1,953,332

Table XV

SUMMARY OF THE PINK SALMON ESCAPEMENTS TO UNITED STATES AND CANADIAN NON-FRASER RIVER SPAWNING AREAS*

United States Spawning Areas	1959	1961	1963
Nooksack	30,000	100,000	150,000
Skagit	200,000	400,000	1,190,000
Stillaguamish	125,000	125,000	640,000
Snohomish	85,000	50,000	275,000
Puyallup	14,000	10,000	10,000
Dosewallips	20,000	22,000	400,000
Duckabush	10,000	14,000	100,000
Dungeness	40,000	70,000	400,000
Elwha	10,000	8,000	40,000
Miscellaneous	6,700	9,000	19,000
Total	540,700	803,000	3,224,000

Canadian Non-Fraser Spawning Areas	1959	1961	1963
Jervis Inlet	255,000	259,000	211,000
Howe Sound	100,000	398,000	750,000
Burrard Inlet	182,000	76,000	200,500
Total	537,000	733,000	1,161,500

* These data were provided through the courtesy of the Washington State Department of Fisheries and the Canada Department of Fisheries.

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